



ORIGINAL RESEARCH PAPER

General Medicine

A RETROSPECTIVE STUDY ON PREVALENCE OF CAROTID ARTERY STENOSIS IN ACUTE ISCHEMIC STROKE PATIENTS IN GOVERNMENT HOSPITAL & MEDICAL COLLEGE, JHALAWAR, RAJASTHAN, INDIA.

KEY WORDS: Acute ischemic stroke, carotid artery stenosis, retrospective

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ABSTRACT

Background: According to WHO, stroke will stay as the second leading cause of death along with IHD for the year 2020. Clinically stroke is the result of a disturbance of cerebral circulation, either due to occlusion or rupture of a blood vessel. Atherosclerosis of internal carotid artery is causative factor in approximately 30% of all ischemic strokes.
Objectives: To find out the prevalence and associated risk factors of carotid artery stenosis in AIS patients.
Method: A retrospective study was carried out on patients of AIS admitted in the JMC during December 2019 to November 2020. Clinical records were evaluated for clinical sign physical findings, NCCT brain and CT angiography 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 assessed and percentage of stenosis of the affected arteries was calculated.
Results: Out of 541 AIS patients, clinical sign and symptoms suggestive of carotid artery stenosis was present in 52 (9.61%) cases while carotid artery stenosis was diagnosed in 25 (4.62%) patients by CTA. Out of 25 patients with carotid stenosis 10 patients had mild, 8 had moderate and 7 had severe stenosis. Statistically significant association of carotid artery stenosis was found with age, male, diabetes, hypertension and smoking (p<0.05).
Conclusion: Prevalence of carotid artery stenosis was 4.62% in AIS patients. Positive predictive value of clinical sign and symptoms of carotid artery stenosis was 42.30% with 99.35% of negative predictive value.

INTRODUCTION

According to WHO estimates, stroke will stay as the second leading cause of death along with ischemic heart disease for the year 2020.¹ Clinically stroke is the result of a disturbance of cerebral circulation, either due to occlusion or rupture of a blood vessel.² About 85% of all strokes are of ischemic origin and caused by thrombotic or embolic blockage of a cerebral artery. Carotid artery stenosis (CAS) is a major risk factor for stroke and for the symptomatic cerebrovascular disease. Approximately 20-30% of all ischemic strokes are caused by carotid occlusive disease.³

During the last three decades there is a decline in the incidence of the disease in the Western population while the burden of the disease in South Asian countries (India, Pakistan, Bangladesh and Sri Lanka) has inclined and is expected to rise further. Globally, 70% of strokes and 87% of both stroke-related deaths and disability-adjusted life years occur in low- and middle-income countries.^{4,5}

Factors which are responsible for stroke includes increasing modernization, lifestyle changes, smoking, increase in prevalence of chronic diseases like diabetes mellitus, hypertension, hyperlipidemia and obesity.^{6,7} Non-modifiable risk factors include age, sex, low birth weight, ethnicity and family history of stroke.⁸

Objectives:

1. To find out the prevalence of carotid artery stenosis in acute ischemic stroke patients.
2. To find associated risk factors for carotid artery stenosis.
3. To find role of symptoms and sign in screening of carotid artery stenosis.

MATERIAL & METHODS:

Study Design:

Retrospective study.

Study Setting:

Jhalawar Medical College & Associate Hospitals.

Study Period:

One Year (December 2019 to November 2020) for data collection, analysis and report writing.

Study Population:

Patients of acute ischemic stroke.

Sampling Technique:

Complete enumerations of acute ischemic stroke patients during study period.

Inclusion Criteria:

1. Adult patients of acute ischemic stroke.
2. Both genders.
3. Consenting participants.

Exclusion Criteria:

1. Patients having history of head injury,
2. Evidence of intracranial hemorrhage or space occupying lesion on CT scan of brain.
3. Patients who recovered from neurological deficit within 24 hours.
4. Patients having signs and symptoms of posterior circulation infarct and patients having signs of meningeal irritation.
5. Unconscious patients.
6. Non-consenting participants.

Method:

Based on inclusion and exclusion criteria, a retrospective study was carried out on patients of acute ischemic stroke admitted in the JMC and associated hospitals during December 2019 to November 2020. Clinical records were evaluated for clinical sign, physical findings and laboratory investigations during hospitalization. Reports of NCCT scan brain and CT angiography were assessed for extra cranial carotid arteries and vertebral arteries condition. Systolic and diastolic velocity of blood flow, carotid intimal medial thickness, presence of athermanous plaque and thrombus was assessed and percentage of stenosis of the affected arteries was calculated. All the information were recorded in individual cases proforma.

Statistical Analysis:

Statistical analysis was performed with SPSS 20.0 (trial version). Data was presented in form of tables and graphs. Chi square test was as test of significance and p value of <0.05 was considered statistically significant.

RESULTS:

Out of 541 patients of acute ischemic stroke, clinical sign and symptoms suggestive of carotid artery stenosis was present in 25 (4.62%) cases while carotid artery stenosis was diagnosed in 25 (4.62%) patients by CTA. Prevalence of carotid artery stenosis was 4.62% among acute ischemic stroke patients. (Figure 01)

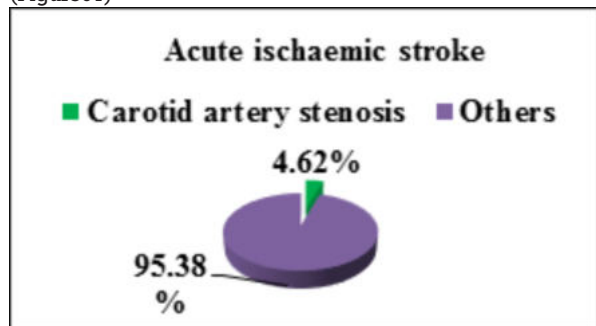


Figure 1: Prevalence of carotid artery stenosis among acute ischemic stroke patients.

Out of 25 patients with carotid stenosis 10 (40%) patients had mild, 8 (32%) patients had moderate and 7 (28%) patients had severe stenosis. (Figure 2)

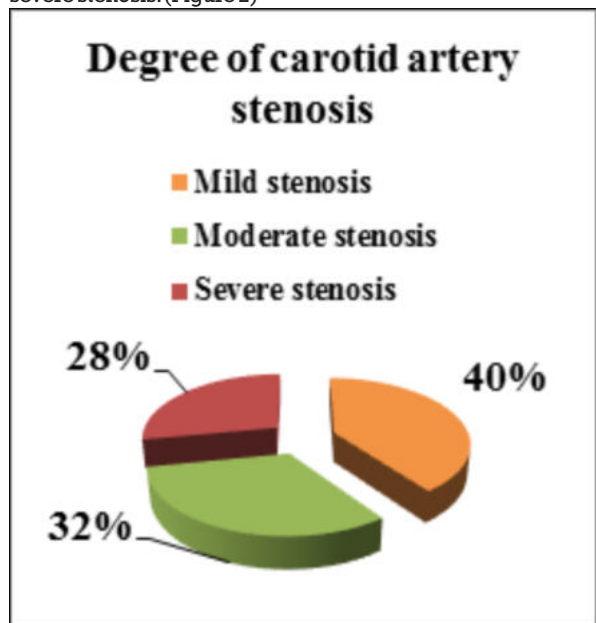


Figure 2: Degree Of Carotid Artery Stenosis.

Most of acute ischemic stroke patients were above the age of 60 years (47.50%) followed by 40 to 60 years (42.52%) and only 54 (9.28%) were below 40 years. Male were 52.13% and female were 47.87%. Risk factors such as diabetes, hypertension, hyperlipidemia were found in 56.19%, 48.42% and 50.46% of cases respectively. Life style factors such as smoking and alcohol use were found in 60.44% and 54.15% cases respectively. Statistically significant association of carotid artery stenosis was found with age above 60 years (p=0.02), male (p=0.041), diabetes (p=0.04), hypertension (p=0.40) and smoking (p=0.007) while association of carotid artery stenosis with hyperlipidemia (p=0.87) and alcohol (p=0.54) was found insignificant. (Table 1) Screening based on symptoms and sign suggestive of carotid artery stenosis had 88% sensitivity, 94.18% specificity, 42.30% positive

predictive value and 99.38% negative predictive value in comparison to CTA. (Table 2)

DISCUSSION:

Out of 541 patients of acute ischemic stroke analyzed in present study, 25 (4.62%) patients were found to have carotid artery stenosis. Out of 25 patients with carotid stenosis mild, moderate and severe stenosis was found in 10 (40%), 8 (32%) and 7 (28%) patients respectively. Prevalence of carotid artery stenosis was found 5.2%, 6.4%, 8%, 17% and 18.18% in study conducted by Subhash Kaul et al⁹, Mineva PP et al¹⁰, Tan TY et al¹¹, Alexandrore et al¹² and Khan et al¹³ respectively. Higher frequency of carotid artery stenosis was established by Shaikh N A et al¹⁴ (39%), Mozzam Ali et al¹⁵ (44%) and Laeeq Ahmed et al¹⁶ (48.5%). Bharathi BM et al¹⁷ observed mild, moderate and severe carotid artery stenosis among 39.13%, 34.78% and 26.09% cases respectively while Subhash Kaul⁹ found mild, moderate and severe carotid artery stenosis among 75.32%, 14.24% and 10.44% cases respectively.

Present study observed that 47.50% cases of acute ischemic stroke were above the age of 60 years followed by 40 to 60 years (42.52%) and ratio of male and female was nearly similar (male 52.13% and female were 47.87%). Shaikh N A¹⁴ and Bharathi BM¹⁷ found 56% and 60% of patients with stroke were older than 60 years. Sethi et al¹⁸ found mean age of patients was 60.03 years and Kerényi et al¹⁹ also noted that mean age of the patient was 66.9 years. Male were 80% and female were 20% in study conducted by Bharathi BM¹⁷ on patients of AIS.

In present study, carotid artery stenosis was significantly associated with age above 60 years, male gender, diabetes, hypertension and smoking while association of carotid artery stenosis with hyperlipidemia and alcohol was found insignificant. Subhash Kaul⁹ establish significant association of carotid artery stenosis with age, hypertension, diabetes, smoking and dyslipidemia. Gender was not significantly associated in various studies^{9,14} although some studies shows male gender was significantly associated with carotid artery stenosis.^{17,20,21}

Bharathi BM¹⁷ found statistically significant association of carotid artery stenosis with male gender, diabetes, hypertension, smoking and dyslipidemia although Shaikh N A¹⁴ found significant association only with age and association with gender, diabetes, hypertension, smoking and hyperlipidemia was found insignificant.

Table 1: Comparison Of Risk Factors In Patients With And Without Carotid Artery Stenosis.

| Risk factors | Acute ischemic stroke patients | | Total (n=541) | P value |
|----------------|-------------------------------------|---|---------------|---------|
| | With carotid artery stenosis (n=25) | Without carotid artery stenosis (n=516) | | |
| Age (in years) | | | | |
| 18 – 40 | 00 (00%) | 54 (100%) | 54 | |
| 41 - 60 | 10 (4.35%) | 223 (96.95%) | 230 | 0.02 |
| >60 | 18 (7.0%) | 239 (93.0%) | 257 | |
| Gender | | | | |
| Male | 18 (6.38%) | 264 (93.61%) | 282 | 0.041 |
| Female | 07 (2.70%) | 252 (97.30%) | 259 | |
| Diabetes | | | | |
| Yes | 19 (6.25%) | 285 (93.75%) | 304 | 0.04 |
| No | 06 (2.53%) | 231 (97.47%) | 237 | |
| Hypertension | | | | |
| Yes | 17 (6.49%) | 245 (93.51%) | 262 | 0.04 |
| No | 08 (2.87%) | 271 (97.13%) | 279 | |

| | | | | |
|----------------|------------|--------------|-----|-------|
| Hyperlipidemia | | | | |
| Yes | 13 (4.76%) | 260 (95.24%) | 273 | 0.87 |
| No | 12 (4.48%) | 256 (95.52%) | 268 | |
| Smoking | | | | |
| Yes | 22 (6.73%) | 305 (93.27%) | 327 | 0.007 |
| No | 03 (1.41%) | 211 (98.59%) | 214 | |
| Alcohol | | | | |
| Yes | 15 (5.12%) | 278 (94.88%) | 293 | 0.54 |
| No | 10 (4.03%) | 238 (95.97%) | 248 | |

Table 2: Role Of Symptoms And Sign In Screening Of Carotid Artery Stenosis.

| Symptoms and sign suggestive of carotid artery stenosis | Carotid artery stenosis by CTA | | Total |
|---|--------------------------------|---------------------------|---------------------------|
| | Yes | No | |
| Yes | 22 | 30 | 52 |
| No | 03 | 486 | 489 |
| Total | 25 | 516 | 541 |
| Sensitivity | Specificity | Positive predictive value | Negative predictive value |
| 88 | 94.18 | 42.30 | 99.38 |

* Chi-square Test Was Used As Test Of Significance And P Value <0.05 Was Considered As Significant.

CONCLUSION:

Prevalence of carotid artery stenosis was 4.62% in AIS patients. Age above 60 years, male gender, diabetes, hypertension and smoking are significant risk factors for occurrence of carotid artery stenosis among acute ischemic stroke patients. Positive predictive value of clinical sign and symptoms of carotid artery stenosis was 42.30% with 99.38% of negative predictive value.

Funding: No funding sources.

Conflict Of Interest: Nil.

REFERENCES:-

- Global Health Estimates. Geneva:World Health Organization;2012. Available from: http://www.who.int/healthinfo/global_burden_disease/en assessed on 21.12.2020.
- Owolabi MO, Akarolo-Anthony S, Akinyemi R, Arnett D, Gebregziabher M, Jenkins C, et al.;Members of the H3Africa Consortium. The burden of stroke in Africa: a glance at the present and a glimpse into the future. *Cardiovasc J Afr.* 2015 Mar-Apr;26.
- Strickman NE, Loyalka P. Carotid artery stenosis: an endovascular specialist's perspective. *Tex Heart Inst J* 2005;32:318-22.
- Strong K, Mathers C, Bonita R. Preventing stroke: saving lives around the world. *Lancet Neurol.* 2007 Feb;6(2):182-7.
- Feigin VL, Forouzanfar MH, Krishnamurthi R, Mensah GA, Connor M, Bennett DA, et al.; Global Burden of Diseases, Injuries, and Risk Factors Study 2010 (GBD 2010) and the GBD Stroke Experts Group. Global and regional burden of stroke during 1990-2010: findings from the Global Burden of Disease Study 2010. *Lancet.* 2014 Jan 18;383(9913):245-54.
- Konin BL, Konin SB, Saraf N, Kinhal SV, Sreedhara MR. Correlation of neurologic dysfunction with Ct-scan brain findings and carotid doppler study in acute ischaemic stroke. *J Evolut Med Dental Sci.* 2014;3(68):14574-87.
- Shariat A, Niknam L, Izadi S, Salehi A. Prevalence of intracranial artery stenosis in Iranian patients with acute ischemic stroke using transcranial Doppler ultrasonography. *Iran J Neurol.* 2016;15(3):133-9.
- Rajamani K, Sunbuli M, Jacobs BS, Berlow E, Marsh JD. Carotid stenosis in African American men. *J Vascular Surg.* 2006;43(6):1162-5.
- Kaul S, Alladi S, Mridula K R, Bandaru VS, Umamashesh M, Anjanikumar D, Lalitha P, Chandrasekhar R. Prevalence and risk factors of asymptomatic carotid artery stenosis in Indian population: An 8-year follow-up study. *Neurol India [serial online]* 2017 [cited 2020 Dec 14];65:279-285
- Mineva PP. Prevalence and outcome of asymptomatic carotid stenosis: A population based ultrasonographic study. *European J Neurol.* 2002;9(4):383-38.
- Tan TY, Chang KC, Liou CW, Schminke U. Prevalence of carotid artery stenosis in Taiwanese patients with one ischaemic stroke. *J Clin Ultrasound.* 2005;33:1-4.
- Alexandrova NA, Gibson C, Maggisano P. Carotid artery disease and peripheral vascular disease. *Stroke* 1995;26:175.
- Khan SN, Vohra EA. Risk factors for stroke: A hospital based study. *Pak J Med Sci* 2007;23:17-22.
- Shaikh N A, Bhatti S et al. Frequency, characteristics and risk factors of Carotid Artery Stenosis in ischaemic stroke patients at Civil Hospital Karachi. *J Pak Med Assoc Vol.* 60, No. 1, January 2010.
- Atif MA, Ali H, Mahmood T. Frequency of carotid atherosclerosis in cerebral infarction. *Pak J Med Sci* 2008;24:69-73.
- Ahmad L. Hyperlipidaemia and its correlation with carotid artery occlusion in patients with ischemic stroke (Dissertation) Karachi. College of Physicians and Surgeons Pakistan 2002.

- Bharathi BM, Gullapalli R. A study on prevalence of carotid artery stenosis in acute ischaemic stroke patients in Amalapuram, Andhra Pradesh, India. *Int J Res Med Sci* 2019;7:2146-50.
- Sethi SK, Solanki RS, Gupta H. Color and duplex doppler imaging evaluation of extracranial carotid artery in patients presenting with transient ischaemic attack and stroke : a clinical and radiological correlation. *Indian J Radiol Imaging* 2005;5:91-8.
- Kerenyi L, Mihalka L, Csiba L, Bacso H, Bereczki D. Role of hyperlipidemia in atherosclerotic plaque formation in the internal carotid artery. *J Clin Ultrasound* 2006;34:283-8.
- Selhub J. Association between Homocysteine and Carotid stenosis. *NEJM.* 1995;333:325.
- Sacco RL. Extracranial carotid stenosis. *N Engl J Med.* 2001;345(15):1113-8.