

Association of Carotid Artery Stenosis with Diabetes Mellitus in Patients of Acute Ischemic Stroke

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ABSTRACT

Objective: To determine the association of carotid artery stenosis with diabetes mellitus in patients of acute ischemic stroke

Study Setting: The study was conducted in Allama Iqbal Memorial Teaching Hospital, Sialkot.

Duration of Study: April 13, 2018 to October 13, 2018

Study Design: Case-Control Study

Subjects & Methods: A total 220 (110 cases/ 110 controls) patients fulfilling selection criteria were enrolled from emergency of Department of Medicine, Allama Iqbal Memorial Teaching Hospital, Sialkot. Blood drop was obtained from each patient by pricking in index finger and using glucometer and lentils. Reading of glucometer was obtained. If BSR was >186mg/dl and patient had history of DM, then DM was labeled. Data were entered and analyzed in SPSS v25.0.

Results: Total 220 (110 cases/ 110 controls) patients were selected for this study. Among cases, mean age was 54.7±9.1 years and 55.1±8.8 years among controls. Among cases, there were 67(60.9%) males and 43(39.1%) females, while 75(68.2%) males and 35(31.8%) females among controls. By comparing diabetes mellitus between groups, it was found that percentage of DM was 41.8% with carotid artery stenosis and 16.4% without carotid artery stenosis. The difference was significant ($p=0.0001$).

Conclusion: There is an association of carotid artery stenosis with diabetes mellitus in patients of acute ischemic stroke. Patients with carotid artery stenosis have significant chances to have diabetes mellitus.

Keywords: Carotid Artery Stenosis, Diabetes Mellitus, Acute Ischemic Stroke.

INTRODUCTION

Acute ischemic stroke is characterized by the sudden loss of blood circulation to an area of the brain, resulting in a corresponding loss of neurologic function. It is caused by thrombotic or embolic occlusion of a cerebral artery and is more common than hemorrhagic stroke [1-2].

Stroke is the leading cause of disability and the fifth leading cause of death in the United States. Each year, approximately 795,000 people in the United States experience new (610,000 people) or recurrent (185,000 people) stroke. Epidemiologic studies indicate that 82-92% of strokes in the United States are ischemic [3-4].

Diabetes is each over-represented amongst patients with acute stroke. It is associated with poor stroke outcome. Symptomatic intracranial hemorrhagic transformation is commoner in diabetes but the treatment effect of thrombolysis appears not to be influenced by blood sugar level [5].

Carotid artery disease is a well-established risk factor for ischemic stroke. Approximately 20-30% of all ischemic strokes are caused by carotid occlusive disease [6].

Arterial stenosis is increasingly recognized as an important factor in defining stroke subtypes and in selecting preventive or therapeutic measures [7-9]. Identifying the causes of carotid artery stenosis among patients with stroke is certain to assist physicians and patients making decisions about the acceptability of treatment program [10].

One Japanese study showed that percentage of DM was 42.6% with carotid artery stenosis and 26.7% without

carotid artery stenosis. The difference was significant ($p=0.022$) [11].

But one local study showed that percentage of DM was 32.78% with carotid artery stenosis and 28.20% without carotid artery stenosis. The difference was insignificant ($p=0.629$) [12].

MATERIALS AND METHODS

This case control study was conducted at Department of Medicine, Allama Iqbal Memorial Teaching Hospital, Sialkot. During from April 13, 2018 to October 13, 2018. Total 220 patients of either gender presented with acute ischemic stroke were enrolled. Patients were ages between 40 to 70 years. Patients with history of head injury, intracranial haemorrhage or space occupying lesion on computed tomographic scan of brain, patients who recovered from neurological deficit within 24 hours, patients having posterior circulation infarct on computed tomographic scan, and patients having signs of meningeal irritation (on clinical examination) were excluded.

Patients were divided equally into two groups, 110 patients with carotid artery stenosis taken as cases and 110 without carotid artery stenosis were taken as control. Informed consent and demographic detail (name, age, gender, BMI, duration of stroke) were obtained.

Blood drop was obtained from each patient by pricking in index finger and using glucometer and lentils. Reading of glucometer was obtained. If BSR was

>186mg/dl and patient had history of DM, then DM was labeled.

Data were entered and analyzed in SPSS v25.0. The quantitative variables i.e. age; BMI and duration of stroke were presented as Mean±S.D. The qualitative variables i.e. gender and DM was presented as frequency and percentage. Odds ratio (OR) was calculated to measure association between DM and carotid-artery stenosis. OR>1 was considered as significant.

RESULTS

Total 220 (110 cases/ 110 controls) patients were selected for this study. Among cases, mean age was 54.7±9.1 years and 55.1±8.8 years among controls. Among cases, there were 67(60.9%) males and 43(39.1%) females, while 75(68.2%) males and 35(31.8%) females among controls. (Table 1)

Table 1: Comparison of gender distribution between groups

Gender	Groups		Total
	Cases	Controls	
Male	67 60.9%	75 68.2%	142 64.5%
Female	43 39.1%	35 31.8%	78 35.5%
Total	110 100.0%	110 100.0%	220 100.0%

According to age distribution among cases, 34(30.9%) were in 40-50 years age group, while 44(40.0%) and 32(29.1%) were in 51-60 years and 61-70 years age groups respectively. According to age distribution among controls, 41(37.3%) were in 40-50 years age group, while 33(30.0%) and 36(32.7%) were in 51-60 years and 61-70 years age groups respectively. (Table 2)

Table 2: Comparison of age distribution between groups

Age Groups	Groups		Total
	Cases	Controls	
40-50 years	34 30.9%	41 37.3%	75 34.1%
51-60 years	44 40.0%	33 30.0%	77 35.0%
61-70 years	32 29.1%	36 32.7%	68 30.9%
Total	110 100.0%	110 100.0%	220 100.0%

Table 3: Comparison of BMI distribution between groups

Body Mass Index (BMI)	Groups		Total
	Cases	Controls	
Normal (18-24.9)	61 55.5%	72 65.5%	133 60.5%
Overweight (25-29.9)	43 39.1%	34 30.9%	77 35.0%
Obese (>30)	6 5.5%	4 3.6%	10 4.5%
Total	110 100.0%	110 100.0%	220 100.0%

According to BMI distribution among cases, 61(55.5%) had normal BMI, while 43(39.1%) and 6(5.5%) were overweight and obese respectively. According to BMI distribution among controls, 72(65.5%) had normal BMI,

while 34(30.9%) and 4(3.6%) were overweight and obese respectively. (Table 3) Among cases, 51(46.4%) had duration of stroke <48 hours, while 59(53.6%) had >48 hours. Among controls, 58(52.7%) had duration of stroke <48 hours, while 52(47.3%) had >48 hours. (Table 4)

Table 4: Comparison of duration of stroke distribution between groups

Duration of Stroke	Groups		Total
	Cases	Controls	
<48 hours	51 46.4%	58 52.7%	109 49.5%
>48 hours	59 53.6%	52 47.3%	111 50.5%
Total	110 100.0%	110 100.0%	220 100.0%

By comparing diabetes mellitus between groups, it was found that percentage of DM was 41.8% with carotid artery stenosis and 16.4% without carotid artery stenosis. The difference was significant (p=0.0001). (Table 5)

Table 5: Comparison of diabetes mellitus between groups

Diabetes Mellitus (DM)	Groups		Total	p-value	odds ratio
	Cases	Controls			
Yes	46	18	64	0.0001	3.674
No	64	92	156		
Total	110	110	220		

DISCUSSION

Carotid artery stenosis is a silent harbinger of stroke. Identification of carotid artery stenosis in an asymptomatic population can help in preventing major cerebrovascular diseases. The risk of ischemic stroke increases with the degree of carotid stenosis.⁷⁸

Because patients with symptomatic occlusion of the internal carotid artery (ICA) and compromised cerebral blood flow are at risk for future ischemic infarcts therefore early identification and accurate determination of the degree of carotid artery stenosis is useful in risk-factor management, with appropriate medical or surgical intervention.⁷⁹

We looked into the presence of well known common risk factors in our patient population and compared these risk factors in patients with and without carotid artery stenosis.

Advanced age, male gender, BMI and duration of stroke significantly contributed to the presence of atherosclerotic plaque, but in majority of cases more than one risk factor was involved in both in the frequency as well as the severity of carotid artery stenosis.

Diabetes is a major risk factor for cerebrovascular and cardiovascular events. Our study noted a prevalence of 41.8% in patients with significant stenosis. Other studies have noted similar findings; 45% by Mustafa et al.,⁸⁰ 47% by Mirharifi et al.,⁸¹ and 42.8% by De Angelis et al.⁸²

In our study, diabetes was found to have a robust independent association with ICA stenosis (OR = 3.674; 95% CI = 1.95–6.91), similar to the findings observed in previous studies by Roh et al.,⁸⁴ (OR = 3.41; 95% CI: 2.00–5.99), De Angelis et al.,⁸² (OR = 3.1; 95% CI: 2.03–4.88), and Fabris et al.⁸³ (OR = 5.3; 95% CI: 2.01–14.2).

Arterial stenosis is increasingly recognized as an important factor in defining stroke subtypes and in selecting preventive or therapeutic measures.⁷⁻⁹ Identifying the causes of carotid artery stenosis among patients with stroke is certain to assist physicians and patients making decisions about the acceptability of treatment program.¹⁰

One Japanese study showed that percentage of DM was 42.6% with carotid artery stenosis and 26.7% without carotid artery stenosis. The difference was significant ($p=0.022$).¹¹

But one local study showed that percentage of DM was 32.78% with carotid artery stenosis and 28.20% without carotid artery stenosis. The difference was insignificant ($p=0.629$).¹²

CONCLUSION

There is an association of carotid artery stenosis with diabetes mellitus in patients of acute ischemic stroke. Patients with carotid artery stenosis have significant chances to have diabetes mellitus.

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