

# Ischemic Stroke and its Association with Risk Factors at Nepalgunj Medical College Teaching Hospital Kohalpur

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## ABSTRACT

**Introduction:** Incidence of stroke increases with age and growing elderly population worldwide, the number of patients with stroke are likely to increase. It is the third most common cause of death in world in that 85% are ischemic in nature. Atherosclerosis is a major risk factor in cerebrovascular diseases. Carotid Intima Media thickness (CIMT) is a surrogate marker of atherosclerosis and provides a non-invasive method for the risk assessment of cerebrovascular diseases. **Aims:** To study the atherosclerotic risk profile of patients admitted with ischemic stroke in medical ward with study of the carotid artery intima-media thickness in patients with acute ischemic stroke. **Methods:** 92 patients with ischemic strokes were studied in this observational study. Carotid Doppler was performed in all patients with emphasis on carotid artery stenosis and intima thickening. Analysis of Association of various risk factors was done in detail. Study period was from June 2019 to May 2020. **Results:** Higher degree of stenosis was associated with hypoechoic plaques and cortical strokes. Hypertension was the most common and most significant risk factor. Multiple risk factors also appear to have synergistic actions **Conclusion:** Various modifiable risk factors provide valuable target for primary and secondary prevention of stroke. Carotid Doppler is a very cheap and highly effective tool for further management of stroke patients. Most of the asymptomatic patients, risk factors may warrant precautionary carotid Doppler, and may result in significant reduction in disease burden on the families and the community and should be encouraged.

**Keywords:** Carotid Doppler, Carotid Intima Media Thickening, Ischemic Stroke

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## INTRODUCTION

Stroke, both ischemic and hemorrhagic, is a common and devastating disorder. Currently, ischemic heart disease and stroke are the leading causes of mortality worldwide and more than 80% of deaths occurring in the low and the middle income countries.<sup>1</sup> The incidence of stroke increases with increasing age and with the growing elderly population worldwide, the number of patients with stroke are likely to increase.<sup>2</sup> The early stage of atherosclerosis is vessel injury induced by multiple conditions that directly or indirectly injure the vessels. Hypertension is the most common cause of vessel injury.<sup>3</sup> In most of the ischemic strokes the underlying pathophysiology is atherosclerosis. The modifiable risk factors are mostly related to

the atherosclerotic burden and include diabetes, hypertension, smoking, and hyperlipidemia.<sup>4</sup> Among Several risk prediction scoring systems the carotid intima-media thickness is a reliable independent marker of cardiovascular disease.<sup>5</sup> In India, studies have reported prevalence of metabolic syndrome ranging from 24.9% in northern India to 41% in Southern India using different definitions.<sup>6</sup> CIMT is a strong predictor of future cardiovascular morbidity and mortality, in particular myocardial infarction and stroke.<sup>7</sup> CIMT has been reported to correlate with myocardial infarction, stroke, and peripheral artery disease.<sup>8</sup> Carotid Intima Media thickness is a surrogate marker of atherosclerosis.<sup>9</sup> IMT is a powerful predictor of coronary and cerebrovascular complications (risk ratio from

2 to 6) with a higher predictive value when IMT is measured at multiple extra cranial carotid sites than solely in the distal common carotid artery.<sup>10</sup> Measurement of carotid IMT could influence a clinician to intervene with primary prevention and medication early.<sup>11</sup>

## METHODS

This is a single site observational study. We enrolled 92 patients with clinical history of cerebrovascular stroke confirmed with CT head from patients who were admitted in medical ward in Nepalgunj Medical College Teaching Hospital, Kohalpur, from June 2019 to May 2020. All the patients were informed about the design of the study, and informed consent was taken. All patients with acute ischemic stroke in the age group of 30-70 years attending General Medicine OPD and inpatients admitted to Nepalgunj Medical College Teaching Hospital were included in this study. Patients with hemorrhagic stroke, ischemic stroke < 30 years of age, past history of CVA, valvular heart disease, on oral anti coagulants, past history of bleeding disorders were excluded. Each patients enrolled in the study were asked in details history regarding the present complaints, past history, addiction history including smoking and drug history. Thorough general examination followed by detailed and complete neurological has been performed, including examination carotid pulsation, peripheral nerve, and vessels. All routine blood investigations, including lipid profile, electrocardiogram and two-dimensional D echo, were done in all patient. CIMT thickness was done by a trained professional using a high resolution B mode ultrasonography system having an electrical linear transducer mid frequency of 7.5 MHz Scans were performed on both right and left extracranial carotid arteries. The IMT was measured as the distance from the leading edge of the first echogenic line to the second echogenic line. The first echogenic line represents the luminal intimal interface and the second line is produced by collagen containing upper layer of intimal adventitia. At each longitudinal projection determination of IMTs were conducted at the side of greatest thickness and at two points 1 cm upstream and 1 cm downstream from the side of greatest thickness as described. The mean of six IMT measurement from both sides were used as the representative value.

**Statistical Analysis:** Statistical analysis was performed using the software package SPSS for Windows 20.0. Data analysis was performed, and chi-square test was used to show the significance relation between various risk factors and carotid intima-media thickening/stenosis as required and possible.  $P < 0.05$  was considered to be statistically significant and  $P < 0.001$  was considered to be statistically highly significant.

## RESULTS

Age	Male	Female	Total
<30	0	8	8
31-40	4	0	4
41-50	20	8	28
51-60	22	6	28
61-70	20	4	24
<b>TOTAL</b>	<b>66</b>	<b>26</b>	<b>92</b>

*Table I: Age distribution.*

Risk Factor	Number of Patients
Hypertension	64
Diabetes Mellitus	24
Smoking	56
Dyslipidemia	56
Previous stroke	24

*Table II: Modifiable Risk Factor.*

Plaque Morphology	Percent of Stenosis			Total
	>70%	50-70	<50%	
Hypoechoic	10	10	40	60
Hyperechoic	4	4	24	32
<b>Total</b>	<b>14</b>	<b>14</b>	<b>64</b>	<b>92</b>

*Table III: Plaque Morphology and Percent of Stenosis.*

CIMT	Hypertension	
	Present	Absent
Present	60	14
Absent	4	14

*Table IV: Pattern of Infarct and Percent of Stenosis.*

Pattern	Stenosis <40%	Stenosis >40%	Total
Subcortical	52	6	58
Cortical	2	32	34
<b>Total</b>	<b>54</b>	<b>38</b>	<b>92</b>

*Table V: Carotid Intima media Thickness (CIMT) and Hypertension.*

Smoking	CIMT	
	Present	Absent
Present	51	5
Absent	20	16

*Table VI: CIMT and Smoking.*

Dyslipidemia	CIMT	
	Present	Absent
Present	50	6
Absent	20	16

*Table VII: CIMT and Dyslipidemia.*

In our study most common age group suffering from stroke was 41-60 years and male predominance was seen as in table I. Among the various modifiable risk factors, hypertension had

the most striking association with stroke in our study. (69.56%) hypertension was closely followed by smoking and dyslipidemia (61%) as shown in table II. Diabetes and previous history of stroke were present in 24 patients each (26%). Important to note that significant stenosis above >40% increased with the number of risk factors as shown in table V, VI and VII. In the 34 patients who had cortical strokes, 32 (95%) had stenosis >40%. Out of 64 patients were found to have hypertension, CIMT was present in 60(93.75%) patients as shown in table v ( $P < 0.02$ ). 51 out of 56 smokers, and 50 out of 56 patients with dyslipidemia had CIMT as well shown in table VI and VII ( $P < 0.05$ ). In the present study, out of 92 patients of ischemic stroke, 66 (62%) patients were treated with medical management whereas 26 (28%) patients who had major stenosis (>50%) within carotid arterial system required carotid intervention. Age is the strongest determinant of stroke, which is more than 40 years.

### DISCUSSION

In our study most common age group suffering from stroke was 41-60 years with male predominance (Table I). In the study 63.3% are male patients and 36.7% are female patients and mean age in our study was 58.7 similar to which was in study done by ratnakar sahuo<sup>12</sup> in JIPMER Pondicherry, India were mean age was 60.2 and also in study of pruisen et al the mean age of the patient population was 63 years.<sup>13</sup> In our study among the various modifiable risk factors, hypertension had the most striking association with stroke. 69% hypertension was closely followed by smoking and dyslipidemia 61% each. The number of plaques was higher among patients with diabetes (33.67%), hypertension (70%), and smoking (40%) in a study done by Dutta et al.<sup>14</sup> In this study Important to note that significant stenosis above >40% increased with the number of risk factors table II. In the 38 patients with >40% stenosis, as many as 32 patients had three risk factors or more as shown in table IV. Important to note that significant stenosis above >40% increased with the number of risk factors which was similar to the study done by Patel et.al in which 34 patients who had cortical strokes, 32 (95%) had stenosis >40%.<sup>15</sup> In our study out of 64 patients were found to have hypertension, CIMT was present in 60(94%) as shown in table V ( $P < 0.02$ ). 51 out of 56 smokers, and 50 out of 56 patients with dyslipidemia had CIMT also as shown in table VI and table VII ( $P < 0.05$ ). In the study stroke with hypertension the mean CIMT was 0.75mm and stroke with both hypertension and diabetes mellitus the mean CIMT was 0.85mm which was similar to mean CIMT  $0.89 \pm 3$  in subjects with hypertension along with carotid lesions,90% in hypertensive patients.<sup>16</sup>

### LIMITATION

Small sample size to give the exact inference of the problem in the community.

### CONCLUSION

We conclude that various risk factors for ischemic stroke may be very important target for prevention of stroke. They not only have extremely strong association with Ischemic stroke but also have synergistic actions. Moreover, they have strong association with the carotid intimal thickening, a factor that dictates the surgical management of Ischemic stroke.

### REFERENCES

1. Abhinav Goyal, Salim Yusuf. The burden of cardiovascular disease in the Indian subcontinent. *Indian J Med Res* 2007;124:235-44
2. Smith WS et al. Harrison's principles of Internal Medicine. 16th ed. McGraw-Hill Companies; 2005. p. 2372-93.
3. Touboul J et al. Carotid intima—media thickness, plaques, and Framingham Risk Score as independent determinants of stroke risk. *Stroke* 2005;36:1741.
4. De Silva DA et al. South Asian patients with ischemic stroke intracranial large arteries are the predominant site of disease. *Stroke* 2007;38:2592-4.
5. Libby P. Prevention and treatment of atherosclerosis. In: Kasper DL, Braunwald E, Fauci AS, Hauser SL, Longo DL, Jameson JL, editors. *Harrison's principles of Internal Medicine*. 16th ed. McGraw-Hill Companies; 2005. p. 1430-3.
6. Gupta R et al. Persistent high prevalence of cardiovascular risk factors in the urban middle class in India: Jaipur Heart Watch-5. *J Assoc Physicians India*. 2012 Mar;60(3):11-6.
7. Kuller L et al. Prevalence of subclinical atherosclerosis and cardiovascular disease and association with risk factors in the Cardiovascular Health Study. *Am J Epidemiol*. 1994 Jun 15;139(12):1164-79.
8. Stein et al. Use of carotid ultrasound to identify subclinical vascular disease and evaluate cardiovascular disease risk: a consensus statement from the American Society of Echocardiography Carotid Intima-Media Thickness Task Force endorsed by the Society for Vascular Medicine. *J Am Soc Echocardiography*. 2008 Feb 1;21(2):93-111.
9. Abhinav Goyal , Salim Yusuf .Burden of cardiovascular disease in Indian subcontinent *Indian J Med Res*, 2007;124;235-244.
10. Simon A et al. Intima-media thickness: a new tool for diagnosis and treatment of cardiovascular risk. *J Hypertens*. 2002 Feb;20(2):159-69.
11. Poredos P. Intima-media thickness: indicator of cardiovascular risk and measure of the extent of atherosclerosis. *Vasc Med*. 2004 Feb;9(1):46-54.
12. Ratnaka et al. Elangovan1 et al Common carotid intima-media thickness in acute ischemic stroke: A case control study- *neuro India*. 2009 sep-oct;57(5);627-30.
13. Pruisen, et al. Carotid intima- media thickness is different in large- and small-vessel ischemic stroke: The SMART study. *Stroke* 2007;38:1371-3.
14. T. K. Dutta et al . Carotid intima-media thickness is a predictor of ischemic strokes. *Neurology India | Sep-Oct 2009 | Vol 57 | Issue 5*.
15. Vitan Patel et al. *International Journal of Medical Science and Public Health* 2018 | Vol 7 | Issue 4. Page 277
16. Avishek Saha et al. *Neurology Asia* 2011; 16(1) : 25 – 31.