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Corresponding Author
Sujin Koshy,
Department of Neurology, Pushpagiri institute of medical sciences and research centre, India

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Atherosclerotic Cardiovascular Disease and its Correlation with Stroke Severity Among Patients having an Acute Ischemic Cerebrovascular Event: A Cross-Sectional Study

[1]Sujin Koshy, [2]B. Vijayalekshmi, [3]Reji Thomas, [4]T.J. Jeethu and [5]N. Jisa Merin Joy

[1-5]Department of Neurology, Pushpagiri Institute of Medical Sciences and Research Centre, India

ABSTRACT

Atherosclerotic cardiovascular disease (ASCVD) is an epidemic throughout the world. It is etiologic for such acute cardiovascular events as myocardial infarction, ischemic stroke, unstable angina and death. The study was conducted with aim of determining the correlation between ASCVD risk score and stroke severity and also to estimate the other independent risk factors associated with a stroke event. The study was conducted in 110 patients who are aged between 40-75 years, presented with history of an acute ischemic stroke event and admitted in a tertiary care hospital. Those who had intracerebral haemorrhage, any stroke mimics, metabolic encephalopathy were excluded from the study. Detailed neurological examination with NIHSS Score and ASCVD risk score estimated and analysis done to compare any association between atherosclerotic cardiovascular risk and stroke severity. This study showed significant association between atherosclerotic cardiovascular risk score and stroke severity ($p<0.017$). Diabetes mellitus was as an independent risk factor among others for ischemic stroke ($p<0.022$). There was a significant association between ASCVD risk and severity of acute ischemic stroke. Although there was a positive correlation between the ASCVD risk and stroke severity, it was not stastically significant. Diabetes mellitus remain an independent risk factor for ischemic stroke.

INTRODUCTION

Cardiovascular and cerebrovascular diseases are frequently interconnected due to underlying pathology involving atherosclerosis and thromboembolism. Patients with Cerebrovascular events have well documented risk of ischemic heart disease. Indeed the prevalence of asymptomatic coronary artery disease (CAD) in patients with stroke or transient ischemic attack is high in autopsy series of fatal stroke[1].

Ischemic stroke is a feared complication of acute myocardial infarction (MI) which is also a strong predictor of mortality[2]. Several cardiac disorders such as AF, valvular diseas and acute MI are associated with an increased risk of ischemic stroke. Therefore it is important to acknowledge not only the characteristics of each disease but also the interrelationships among these diseases. Cardiovascular-cerebrovascular disorders require a multidisciplinary diagnostic and therapeutic approach.

There are only few studies related to the impact of severity of symptomatic ischemic cerebrovascular events in patients with high risk atherosclerotic cardiovascular risk factors. Atherosclerosis causes disability and death from its contributions to disabling consequences like cerebro vascular accidents, vascular dementia, peripheral arterial disease, heart failure, renal artery stenosis, carotid artery stenosis and embolization, renal failure, systemic hypertension, aortic disease, mesenteric artery disease, erectile dysfunction, These can take so long to manifest that they are ignored in randomized controlled trials (RCTs). Assuming that by reducing acute events alone will also prevent long-term consequences of atherosclerosis will be eliminated is unwarranted by current evidence and has not been adequately studied. These slower to develop manifestations of atherosclerotic disease should also be prioritized and equal efforts should be made to prevent them[3].

Aim of the study

- To determine the correlation between ASCVD risk score and stroke severity
- To estimate the other independent risk factors associated with a stroke event

MATERIAL AND METHODS

The study was conducted among patients who are aged between 40-75 presented with history of an acute ischemic stroke event and admitted in a tertiary care hospital. MRI Brain study was done in all those patients to confirm the acute ischemic vascular event. As part of evaluation a detailed history a thorough neurological examination with NIHSS score was done (Fig. 1) to assess the stroke severity. Stroke severity is

1a—Level of consciousness	0 = Alert; keenly responsive 1 = Not alert, but arousable by minor stimulation 2 = Not alert; requires repeated stimulation 3 = Unresponsive or responds only with reflex
1b—Level of consciousness questions: What is your age? What is the month?	0 = Answers two questions correctly 1 = Answers one question correctly 2 = Answers neither questions correctly
1c—Level of consciousness commands: Open and close your eyes Grip and release your hand	0 = Performs both tasks correctly 1 = Performs one task correctly 2 = Performs neither task correctly
2—Best gaze	0 = Normal 1 = Partial gaze palsy 2 = Forced deviation
3—Visual	0 = No visual lost 1 = Partial hemianopia 2 = Complete hemianopia 3 = Bilateral hemianopia
4—Facial palsy	0 = Normal symmetric movements 1 = Minor paralysis 2 = Partial paralysis 3 = Complete paralysis of one or both sides
5—Motor arm Left arm Right arm	0 = No drift 1 = Drift 2 = Some effort against gravity 3 = No effort against gravity 4 = No movement
6—Motor leg Left leg Right leg	0 = No drift 1 = Drift 2 = Some effort against gravity 3 = No effort against gravity 4 = No movement
7—Limb ataxia	0 = Absent 1 = Present in one limb 2 = Present in two limbs
8—Sensory	0 = Normal; no sensory loss 1 = Mild-to-moderate sensory loss 2 = Severe-to-total sensory loss
9—Best language	0 = No aphasia; normal 1 = Mild-to-moderate aphasia 2 = Severe aphasia 3 = Mute; global aphasia
10—Dysarthria	0 = Normal 1 = Mild-to-moderate dysarthria 2 = Severe dysarthria
11—Extinction and inattention	0 = No abnormality 1 = Visual, tactile, auditory, spatial, or personal inattention 2 = Profound hemi-inattention or extinction
Score = 0–42	

Fig. 1: The National institute of health stroke scale(NIHSS). Note: NIHSS is a systematic assessment tool that provides a quantitative measure of stroke-related neurological impairments

graded as minor stroke score 1-4 moderate stroke 5-15 moderate to severe stroke 16-20 and severe stroke 21-42. Routine blood investigations including fasting and post prandial blood sugars, HbA1c, fasting lipid profile and cardiac evaluation with 2D Echocardiography were done to look for RWMA, LV dysfunction, valvular heart disease and LVH. ASCVD score was calculated in all patients using ASCVD calculator by entering variables like age, presence of diabetes, smoking, hypertension, gender, systolic blood pressure, treatment for hypertension and data entered in Microsoft Excel sheet. Those who had intracerebral haemorrhage any stroke mimics, metabolic encephalopathy were excluded from the study.

Analysis: The major statistical tools used for this study is Chi square and percentages for categorical variables and for continuous variables independent sample t test and Pearson product moment correlation.

RESULTS

Total 110 individuals of which 73 were males and 37 were females. Stroke severity has been calculated with NIHSS score and ASCVD risk score calculated using ASCVD risk estimator tool.

NIHSS score: Only five patients (4.5%) had severe stroke. Six patients (5.5%) had moderate to severe 53 (48.2%) had moderate and 46 (41.8%) had minor stroke based on the NIHSS score (Fig. 2) (Table 1-4).

ASCVD score: Majority of patients (N = 54-49.1%) belonged to high atherosclerotic risk category. Rest had Low (N = 11-10.2%) Borderline (N = 7-6.2%) and Intermediate risk (N = 38-34.5%) based on the score (Fig. 3).

DISCUSSIONS

Both coronary artery disease and ischemic stroke have many common risk elements like atherosclerosis hence there are various interventions to reduce that risk[4]. Epidemiological studies has revealed that dyslipidaemia is major risk factor for cardiac events and systemic hypertension associated with cerebrovascular events[5]. Artherogenesis in both

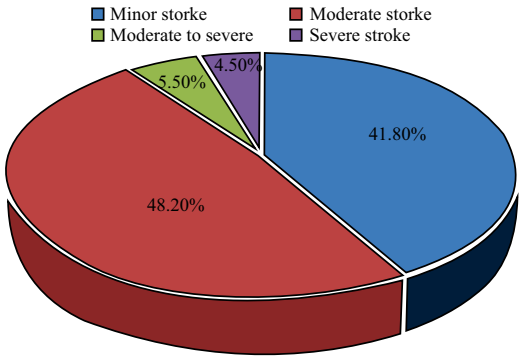

Fig. 1: Stroke severity

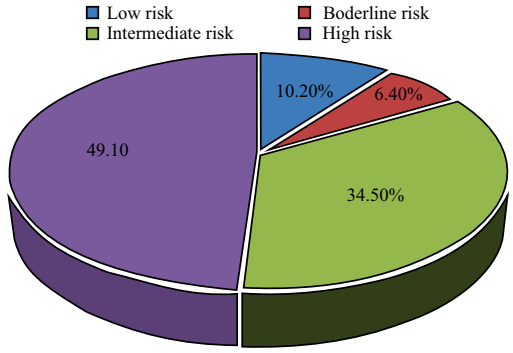

Fig. 2: ASCVD score

Table 1:

	ASCVD						
NIHSS	Low risk <5%	Borderline (5-7.5%)	Intermediate risk: (7.5-20%)	High risk: >20%	Total	χ^2	p-value
Minor stroke (1-4)							
Count	3	6	9	28	46	20.10	0.017
Percentage	6.5	13.0%	19.6%	60.9%	100.0%		
Moderate stroke (5-15)							
Count	6	1	25	21	53		
Percentage	11.3	1.9%	47.2%	39.6%	100.0%		
Moderate to severe stroke (16-20)							
Count	0	0	2	4	6		
Percentage	0.0	0.0%	33.3%	66.7%	100.0%		
Severe stroke (21-42)							
Count	2	0	2	1	5		
Percentage	40.0	0.0%	40.0%	20.0%	100.0%		

Table 2: Correlation between ASCVD score and NIHSS

Correlations	ASCVD	NIHSS
ASCVD		
Pearson Correlation	1	0.017
Sig. (2-tailed)		0.856
N	110	110
NIHSS		
Pearson Correlation	0.017	1
Sig. (2-tailed)	0.856	
N	110	110

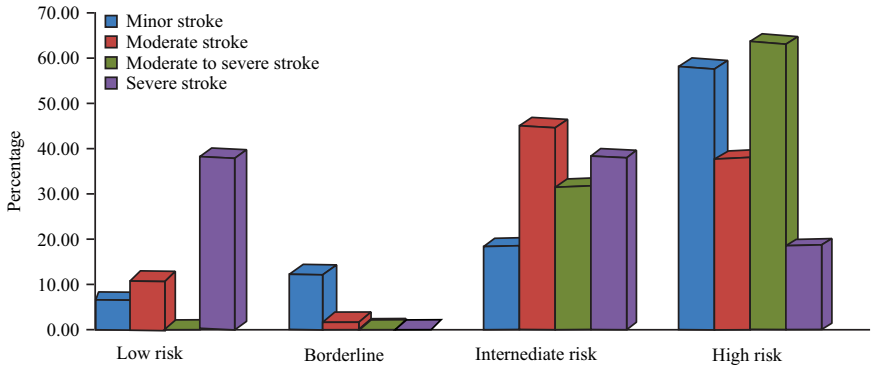

Fig. 4: Stroke severity vs ASCVD score

Table 3: NIHSS score and other independent risk factors

	ASCV						
	Low risk <5%	Borderline (5-7.5%)	Intermediate risk: (7.5-20%)	High risk: >20%	Total	χ^2	p-value
Diabetes							
No							
Count	7	3	14	8	32	13.35	0.004
Percentage	21.9%	9.4%	43.8%	25.0%	100.0%		
Yes							
Count	4	4	24	46	78		
Percentage	5.1%	5.1%	30.8%	59.0%	100.0%		
Smoking							
No							
Count	11	7	37	49	104	4.00	0.261
Percentage	10.6%	6.7%	35.6%	47.1%	100.0%		
Yes							
Count	0	0	1	5	6		
Percentage	0.0%	0.0%	16.7%	83.3%	100.0%		
Echo- lvh							
No							
Count	5	6	29	39	79	4.92	0.177
Percentage	6.3%	7.6%	36.7%	49.4%	100.0%		
Yes							
Count	6	1	8	15	30		
Percentage	20.0%	3.3%	26.7%	50.0%	100.0%		
Rwma							
No							
Count	10	6	36	47	99	1.75	0.626
Percentage	10.1%	6.1%	36.4%	47.5%	100.0%		
Yes							
Count	1	1	2	7	11		
Percentage	9.1%	9.1%	18.2%	63.6%	100.0%		
LV sys dysfunction							
No							
Count	8	7	36	46	97	6.05	0.109
Percentage	8.2%	7.2%	37.1%	47.4%	100.0%		
Yes							
Count	3	0	2	8	13		
Percentage	23.1%	0.0%	15.4%	61.5%	100.0%		

Table 4: Association of Diabetes with severity of stroke among males and females in which males had higher incidence of stroke

	NIHS						
Diabetes	Minor stroke	Moderate Stroke	Moderate to severe stroke	Severe stroke	Total	χ^2	p-value
Male No							
Count	12	20	0	0	32	9.55	0.022
Percentage		37.5%	62.5%	0.0%	0.0%	100.0%	
Male Yes							
Count	34	33	6	5	78		
Percentage	43.6%	42.3%	7.7%	6.4%	100.0%		

cereberal vessels have similar characteristics[6]. Few studies are only there to identify any difference in finding the risk factors for both. Study conducted by Iram faqir[7] showed that smoking, ApoB, low ApoA1, male sex and education level of ≥ 9 years of schooling were preferentially associated with cardiac event compared to ischemic stroke. Conversely age showed a stronger association with ischemic stroke than with cardiac event. There are no studies regarding the type of cerebrovascular ischemic stroke in these subsets of

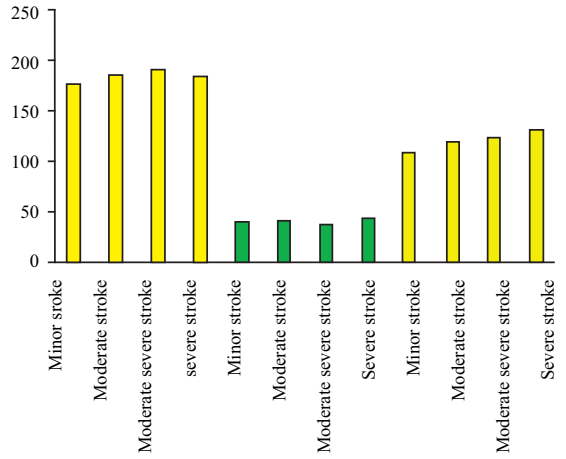

Fig. 5: TCHOL, HDL and LDL

patients having ASCVD risk. In a prospective Korean study the metabolic syndrome was related more to intracranial than to extra cranial lesions and to posterior and not anterior circulation strokes.[8]

The present study showed there is significant association between stroke severity and ASCVD score (Table 1). Even though there is positive correlation is there but not stastically significant (Table 2). Diabetes remain an independent risk factor for stroke (Table 4). Intracranial atherosclerosis is one of them major risk factor for fatal stroke[9]. What cause intracranial artherosclerosis is not very clear[10]. Our study showed there is no significant association with dyslipidemia and stroke severity (figure 5). Extensive coronary artherosclerotic disease is associated with intracranial artherosclerosis. Stroke education for controllable risk factors like obesity, unhealthy diet, smoking cessation, control of hypertension and diabetes need to be initiated. ASCVD enhancing features like strong family history, CKD, Metabolic syndrome, chronic inflammatory conditions, premature menopause presence of lipid biomarkers like elevated HsCRP, Lipoprotein a apo-b need to be identified[11]. Diet and recommendation for lowering LDL-C and Hypertension, physical activity recommendation for weight reduction needs to be implemented.

CONCLUSION

Artherosclerotic cardiovascular events vary individually depending upon the risk. However there are not much literature available regarding the type of ischemic stroke these individual will have. Our study showed there is significant association between ASCVD risk and stroke severity. There was no direct correlation between dyslipidemia and stroke severity. Diabetes remain and independent risk factor for ischemic stroke in our study.

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