Recurrence of Ischemic Stroke Patients with Common Risk Factors

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Abstract:

Background: *Mortality and morbidity due to recurrent ischemic stroke is gradually increasing in Bangladesh due to gradual increase of life expectancy. Previously many studies were done to identify the risk factors of ischemic stroke. But there was scanty data about risk factors of recurrent ischemic stroke. So,it is time demanding to find out those risk factors for ischemic stroke recurrence to reduce the mortality and morbidity from recurrent ischemic stroke. The objective of the study was to determine the frequency of recurrence ischemic stroke events within one year of follow up after discharge from hospital admitted due to first ever stroke.* **Methods:** *This is a prospective cohort study. This study was conducted on 150 patients admitted in Neurology ward of BSMMU, presenting with first ever ischemic stroke. Patients mRS were evaluated three monthly interval for one year. Sudden onset mRS deterioration than previous one during this one year period was categorized as recurrence.* **Results:** *Stroke recurrence was found in 30 patients including 8 patients who died due to stroke recurrence. the most frequent age group was > 75 years representing 44.4% who developed recurrence of stroke The cumulative risk of recurrence rate was 14.7% at three months, 15.3% at six months, 17.3% at ninth months,20% at one year. Old age, Male sex, Hypertension, DM and dyslipidemia were the most common risk factors among recurrent stroke patients.* **Conclusion:** *It was concluded that in hospital admitted patients of first ever stroke, recurrence events was more in patients of older male patients with multiple risk factors.First three months was the worst period for recurrence after index stroke.*

Key words: *stroke, recurrence, risk factors etc.*

Introduction:

Among stroke incidence and prevalence of ischemic stroke is quite high. So disability due to ischemic stroke has a greatimpact on public health in any country. In our country life expectancy gradually increasing, so incidenceof ischemic stroke and stroke recurrence is also gradually increases in population. The etiopathogenesis of stroke is multifactorial. Multiple modifiable and non-modifiable risk factors being associated. Nonmodifiable risk factors for stroke include older age, male gender, ethnicity, family history, and prior history of stroke. Modifiable risk factors include arterial hypertension, DM, dyslipidemia, heart disease, and carotid artery disease. Lifestyle factors include lack of physical activity, cigarette consumption, alcohol abuse etc. Less well-documented risk factors include blood markers (e.g., C-reactive protein), ankle-brachial blood pressure ratios, silent cerebral infarcts, white-matter hyperintensities on magnetic resonance imaging (MRI), and degree of carotid artery intima-media thickness. Findings from the INTERSTROKE study suggest that hypertension, current smoking, high waist-to-hip ratio, sedentary lifestyle, diabetes mellitus, alcohol intake,

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psychosocial stress and depression, cardiac causes and ratio of apolipoproteins B to A1 account for about 90% risk of stroke[1].Hypertension (63%) was the main risk factor for stroke,followed by heart disease (24%), diabetes mellitus (DM) (21%), and hyperlipidaemia (7%). A study done within 400 hospitalized stroke patients in Dhaka medical college Hospital from July to December 2007 revealed 56·25%patients had cerebral infraction. The risk factors present in the stroke cases included hypertension (58·62%) cigarette smoking (53·79%), lipid disorder (48·01%), heart diseases (25·75%), DM (20·01%), and previous history of stroke (10·61%) [2]. In another study, the risk factors for stroke were investigated in 85 young patients (aged 14 to 45 years) hospitalized at the DMCH between January 2008 and July 2009.[3]The majority (61·18%) suffered from an Ishemic stroke . The common risk factors were hypertension (60·00%), hypercholesterolaemia (38·80%), diabetes (35·20%), smoking (32·90%), premature atherosclerosis (8·20%), and oral contraceptive use (3·8%).

Stroke recurrence after initial stroke vary widely in different studies from 3 to 22% in one year[4,15]. Recurrent stroke was defined as a new cerebrovascular event that met one of the following criteria[7,12]. (1) If new neurological deficit that was clearly different from that of the index stroke, (2) if neurological deficit follow anatomical area other than index case (3) if new deficit follow stroke subtype different from that of the index stroke. Systemic causes of clinical deterioration after an initial stroke (eg, hypoxia, hypotension, hyperglycemia, infection) may worsening symptoms of index cases during follow up[16]. It must be excluded before diagnosis of recurrence event. There was no definition of early recurrence, In this study if recurrence within three months after index stroke diagnosed as early recurrence and a similar criterion had been used by other studies of early recurrence[17,18].

Many studies were done for modifiable and non-modifiable risk factors for ischemic stroke. But there was scanty data in home and abroad about risk factors for recurrent stroke. No consensus yet exists about contribution of risk factors for recurrent stroke. This study showed the effect of widely accepted stroke risk factors on recurrent stroke after first-ever ischemic infarction.

Methods:
This study was done on the first ever ischemic stroke patients admitted in the inpatient Neurology Department of BSMMU. Total 162 patients were selected for study, but due to cognitive impairment after stroke seven patients were excluded, another five patients were excluded from the study due to non-co-operative in three monthly follow up. So total 150 patients were analyzed for recurrence three months interval up to one year.All patients give follow up for recurrence by measuring mRS scale comparing with the previous status. Deterioration of any index case mRS scale than previous was recorded as recurrence.

Results :

Table-I
Distribution of the patients according to age

Age (Years)	n	Recurrence		p value
		Yes	No	
≤45	15	0 (.0)	15 (100.0)	
46-55	35	6 (17.1)	29 (82.9)	
56-65	51	11 (21.6)	40 (78.4)	
66-75	40	9 (22.5)	31 (77.5)	
>75	9	4 (44.4)	5 (55.6)	
Total	150	30 (20.0)	120 (80.0)	
Mean±SD		64.80±9.48	60.04±11.120	.033[a]

Table I shows that the most frequent age group was > 75 years representing 44.4% who developed recurrence of stroke but 55.6% was not developed. But most of the ischemic stroke patients were 56-65 years group among them 21.6% patients developed recurrence.

Table-II
Distribution of the patients according to sex by recurrence

Sex	n	Recurrence		p value
		Yes	No	
Male	80	17 (21.2)	63 (78.8)	0.682[a]
Female	70	13 (18.6)	57 (81.4)	
Total	150	30 (20.0)	120 (80.0)	

Table II showed male patient developed more recurrence.

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Table-III

Distribution of the patients according to co-morbidity/risk factors by age

Co-morbidity / risk factors	n	≤45	46-55	56-65	66-75	>75	p value
HTN							
• Yes	106	8 (7.5)	25 (23.6)	36 (34.0)	32 (30.2)	5 (4.7)	0.302[a]
• No	44	7 (15.9)	10 (22.7)	15 (34.1)	8 (18.2)	4 (9.1)	
DM							
• Yes	75	5 (6.7)	23 (30.7)	28 (37.3)	14 (18.7)	5 (6.7)	0.053[a]
• No	75	10 (13.3)	12 (16.0)	23 (30.7)	26 (34.7)	4 (5.3)	
Smoking							
• Yes	37	2 (5.4)	9 (24.3)	15 (40.5)	8 (21.6)	3 (8.1)	0.643[a]
• No	113	13 (11.5)	26 (23.0)	36 (31.9)	32 (28.3)	6 (5.3)	
Dyslipidaemia							
• Yes	69	4 (5.8)	19 (27.5)	23 (33.3)	19 (27.5)	4 (5.8)	0.511[a]
• No	81	11 (13.6)	16 (19.8)	28 (34.6)	21 (25.9)	5 (6.2)	
Family history							
• Yes	39	5 (12.8)	13 (33.3)	10 (25.6)	10 (25.6)	1 (2.6)	0.306[a]
• No	111	10 (9.0)	22 (19.8)	41 (36.9)	30 (27.0)	8 (7.2)	
AF							
• Yes	25	1 (4.0)	6 (24.0)	12 (48.0)	2 (8.0)	4 (16.0)	0.019[a]
• No	125	14 (11.2)	29 (23.2)	39 (31.2)	38 (30.4)	5 (4.0)	

Table-IV

Distribution of the patients according to co-morbidity/risk factors by recurrence

Co-morbidity/risk factors	n	Recurrence Yes	Recurrence No	p value
HTN				
• Yes	106	22 (20.8)	84 (79.2)	0.720[a]
• No	44	8 (18.2)	36 (81.8)	
DM				
• Yes	75	17 (22.7)	58 (77.3)	0.414[a]
• No	75	13 (17.3)	62 (82.7)	
Smoking				
• Yes	37	6 (16.2)	31 (83.8)	0.507[a]
• No	113	24 (21.2)	89 (78.8)	
Dyslipidaemia				
• Yes	69	17 (24.6)	52 (75.4)	0.190[a]
• No	81	13 (16.0)	68 (84.0)	
Family history				
• Yes	39	5 (12.8)	34 (87.2)	0.193[a]
• No	111	25 (22.5)	86 (77.5)	
IHD				
• Yes	25	6 (24.0)	19 (76.0)	0.584[a]
• No	125	24 (19.2)	101 (80.8)	

Table IV showedindex stroke patients who were hypertensive, diabetic and dyslipidemic had increased incidence of recurrence, though it was not statistically significant.

Table-V
Distribution of the patients according to multiple risk factors by recurrence

Multiple risk factors	n	Recurrence		p value
		Yes	No	
No risk factor	15	1 (6.7)	14 (93.3)	0.305[b]
One risk factor	30	5 (16.7)	25 (83.3)	0.610[a]
Two risk factors	37	11 (29.7)	26 (70.3)	0.088[a]
Three risk factors	30	7 (23.3)	23 (76.7)	0.610[a]
Four risk factors	27	5 (18.5)	22 (81.5)	0.832[a]
Five risk factors	11	1 (9.1)	10 (90.9)	0.694[b]

Table III showed most of the patient suffered from hypertension followed by DM and dyslipidemia but it was not statistically significant in any age group.

Combinations modifiable risk factors analysis showed no statistically significant contribution to recurrence of stroke.

Table-VI
Distribution of the patients according to recurrence

Recurrence	Frequency	Percent
Yes	30	20.0
No	120	80.0
Total	150	100.0

Recurrence of ischemic stroke was 20% after one year follow up.

Table-VII
Distribution of the patients according to death

Death	Frequency	Percent
Yes	8	5.3
No	142	94.7
Total	150	100.0

Case Fatality Rate = 26.7%

Table-VIII
Distribution of the patients according to cumulative recurrence

Recurrence	Frequency	Percent
Three months	22	14.7
Six months	23	15.3
Nine months	26	17.3
Twelve months	30	20.0

Most of the patients suffered from recurrence of stroke in first three months which was about 14%. After one year it was 20%.

Discussion:
In this study, stroke recurrence with multiple risk factors up to 1 year after initial ischemic stroke was estimated. The results showed that in one-year follow-up period, 20% of the patients had suffered from an ischemic stroke recurrence; moreover, 5.3% of patients died as a consequence of the recurrence. This study found that the cumulative risk of recurrence was 14.7 % at 3 months, 15.3% at 6 months 17.3% at 9 months and 20% at 1 year. Recurrence of stroke within first three months in other studies was variable. In a Japanese study , they showed it was 4.9% [19]. American heart association showed recurrence within 3 months was 7.4% [20]. This study showed recurrence rate was higher than other studies . Most probably due to inclusion of more aged patients in this study. At one year the annual risk of stroke recurrence also variable in many studies ,13% the Oxfordshire Community Stroke Project [21] 11.91% and 17.7% in china .[22, 23] 4% in perth, western Australia,[24] 8% in south carolina[25]. This study showed it was 20% a little higher than other studies. In this study 8 patients (5.3%) died. Case fatality rate was 26.7% . one study showed case fatality rate was 31.8% [20]. This is also near similar to previous studies. The average age at stroke onset was 64.80 ± 9.48 years. Though most of the ischemic stroke patients were 56-65 years group, among them 21.6% patients developed recurrence. Maximum patients who developed recurrence of stroke were > 75 years age group which was 44.4%. It was not statistically significant. 21.2% male patient was developed recurrence of stroke but 18.6% female patients were developed recurrence which was also not statistically significant. This male predominant recurrence of stroke was similar with the Framingham Study[6] but not in other studies.[15] The profile of the five modifiable selected

risk factors at enrollment for these 150 stroke patients was analyzed. Only 15 (10%) patients had none of the above five risk factors. Of the remaining, 30 (20%) patients had only one risk factor, 37 (24.66%) had two risk factors, 30 (20%) had three risk factors, 27 (18%) had four risk factors, and 11 (7.33%) had all five risk factors. Most of the recurrent stroke patients has been suffering from two risk factors (29.7%) patients (Hypertension and DM) . Maximum stroke patient (74.9%) has been suffering from hypertension in this study. Previously one study showed hypertension (HTN) was associated with a higher risk of stroke recurrence [6] same result also showed in the Lehigh Valley Study[16] but it was not found in Chicago, Maryland, and Boston using the Stroke Data Bank,[7]DM was the second most common risk factors in this study. About 50% stroke patients has been suffering from DM. Similarly, patients with diabetes mellitus (DM) had an increased risk of stroke recurrence in several stroke cohorts studied by Hier et al,[7] Alter et al,[16] and Olsson et al [15]but not by Viitanen et al[14] or Broderick et al[26].

Among 150 patients, Sixty nine patient (46%) has been suffering from dyslipidemia. Among them 17 (24.7%) has recurrence of stroke. One previous study showed dyslipidaemia in recurrent stroke patients was 56%[27]. Inthis study 37patients was smoker (24.66%).Among them 16.2% patients had recurrence of stroke. One study showed 9.5% smoker developed recurrence of stroke[28].

In this study 39 patients has history of stroke in first degree relatives. Among them 12.8% had recurrence. One study showed 6.2% had family history[29]. Among 150 index stroke patients 25 patients has arrythmia.Recurrent stroke events was occurred in 24 % patients. One study showed arrthmia was present in only 5% patients who developed recurrence stroke within one year[30]. In the LVRSS Cox modeling analysis, of those cardiac conditions studied, only AF emerged as a significant predictor for stroke recurrence and 16% of patients was suffering from AF [31].

Conclusion:
Older age with multiple risk factors were more vulnerable for recurrence of ischemic stroke. First three months were the worst time for recurrence after index stroke.

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