Original Research Article

A study of risk factors for stroke and their effect on survival

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Abstract

Introduction: Stroke is global health problem and is a leading cause of disability. It is usually the end result of predisposing conditions that originated years before the ictus. Identification of its modifiable risk factors can help in planning preventive strategies. The present study aims at evaluating the role of various risk factors in stroke and their effect on functional outcome in ischemic and haemorrhagic stroke.

Materials and methods: The study was carried out on total of 150 new onset acute stroke patients admitted at a tertiary care centre. Risk factors were evaluated in all the cases. The patients were categorized as Infarction or haemorrhagic stroke based on CT findings. For the purpose of analysis, the patients were divided into two groups as Ischemic or Haemorrhagic stroke. The risk factors and outcome between the two was compared between the two using appropriate statistical measures (using SPSS ver. 20).

Results: Overall the prevalence of Ischemic stroke was higher than haemorrhagic stroke (81.3% vs 18.7%). Hypertension was the single largest risk factor for stroke (50.7%) with a significant association with hemorrhagic stroke (78.6% vs 44.3%; $p< 0.01$). Overall mortality rate was 10.7% with a significantly poor outcome was associated with hypertension (17.1%) and IHD (31.3%). Overall survival rate was more in patients with infarct as compared to patients with IC Bleed (93.4% vs 71.4%).

Conclusion: Hypertension, dyslipidemia and diabetes are the biggest risk factors for stroke. Preventive strategies aimed at early detection and treatment of these factors, appropriate medication, life style changes and public awareness about ill effects of cigarette smoking and excessive alcohol use can contribute in reduction of stroke burden

Key words

Hemorrhagic stroke, Hypertension, Ischemic stroke, Outcome, Risk factors.

Introduction

Stroke is a common medical emergency. The incidence rises steeply with age, and in many lower and middle income countries. It is rising in association with less healthy life styles. Stroke is the most common clinical manifestation of cerebrovascular disease of which more than 99% are due to arterial involvement and lees than 1% due to venous involvement in the form of cerebral venous thrombosis (CVT) and results in episodes of brain dysfunction. Among arterial causes 85% are due to infarction and 15% due to haemorrhage [1].

A stroke (or cerebrovascular accident) is a rapidly developing clinical symptoms and /or signs of focal, and at times global (applied to patients in deep coma and to those with sub arachnoid hemorrhage) loss of cerebral function, with symptoms lasting more than 24 hours or leading to death, with no apparent cause other than that of vascular origin [2]. The national commission of macro-economics and health has estimated that there will be 1.67 million stroke cases in India by 2015 [3].

It is generally acknowledged that stroke is a multi-factorial condition. A number of risk factors have been shown to be associated with stroke namely age, sex, hypertension, serum cholesterol, alcohol intake, smoking diabetes mellitus obesity, physical inactivity, family history of transient ischemic attack and dietary factors. However, their relative contribution in the outcome of stroke varies from study to study and from population to population [4].

Strokes can be broadly classified as hemorrhagic or non-hemorrhagic. Intracerebral haemorrhage (ICH), classified as either primary or secondary, occurs in ≈10% to 15% of all strokes and is associated with a higher risk of fatality compared with cerebral infarction (CI) [5-7]. Primary ICH, ranging from 78% to 88% of all haemorrhages, derives from the spontaneous rupture of small vessels damaged by chronic hypertension or amyloid angiopathy [7]. Secondary ICH occurs in a minority of patients in association with vascular abnormalities, tumours, or impaired coagulation. About one half of all patients with primary ICH die within the first month after the acute event [8].

Regarding recovery, it is generally believed that hemorrhagic stroke survivors have better neurological and functional prognoses than non-hemorrhagic stroke survivors, but currently available data do not definitively answer all questions. In a case-control study, hemorrhagic stroke patients showed functional gains somewhat faster than ischemic patients [9], but their data were in disagreement with those of a prior study [10]. In other outcome studies, other prognostic factors such as stroke severity, age, and onset-admission interval (OAI) showed to be relevant prognostic factors in functional outcome [11-15]. However, multivariate models, used in most outcome studies, tend to be specific but less sensitive and do not allow a careful evaluation of the specific role of each factor in determining functional outcome.

Thus present study was planned to obtain a clear characterization of the role of various risk factors in stroke and their effect on functional outcome in ischemic and haemorrhagic stroke.

Materials and methods

Source of data

A total of 150 new onset acute stroke patients admitted at a tertiary care centre.

Duration of study

The study was carried out on patients presenting with stroke during 12 months period from January 2011 to December 2012 with acute stroke.

Inclusion criteria

- Age between 20 to 80 years of age.
- Those giving informed consent.

Exclusion criteria

- Patients with absence of brain lesion on CT scans or MRI were excluded to avoid enrolling transient ischemic attack patients.
- Patients with sequelae of secondary haemorrhages (neurological deficits after surgical decompression of haemorrhages or trauma-, tumour-, or surgery-related haemorrhages).
- Patients with subarachnoid haemorrhage, patients with previous strokes (including patients with full clinical remission), and those with other chronic disabling pathologies (i.e., severe Parkinson's disease; polyneuropathy; severe cardiac, liver, or renal failure; and cancer).

Detail clinical history was obtained and clinical examination performed as per standard proforma. Blood hemogram, sugar, lipid profile, urea, creatinine, electrolytes and 12 lead ECG was performed in all the cases. Echocardiography was done in selected cases. Carotid Doppler studies was done where indicated. The patients were categorized as Infarction or haemorrhagic stroke based on CT findings.

Risk factors were evaluated in all the cases. Hypertension was considered to be present if history or treatment of hypertension was present. History of smoking and alcohol was evaluated. History of diabetes mellitus or its treatment was obtained in all the cases. Further investigations were done as indicated. Upper limit of total blood cholesterol, low density lipoprotein and triglyceride were 220 mg/ dl, 165 mg/dl and 170 mg/dl respectively as per our lab reference values.

For the purpose of analysis, the patients were divided into two groups as Ischemic or Haemorrhagic stroke. The risk factors and outcome between the two was compared between the two using appropriate statistical measures (using SPSS ver. 20).

Results

Overall the prevalence of Ischemic stroke was higher than haemorrhagic stroke (81.3% vs 18.7%). Mean age of the study subjects was 62.3 years with male predominance (81.3%). Hypertension was the single largest risk factor for stroke (50.7%) with a significant association with hemorrhagic stroke (78.6% vs 44.3%; $p< 0.01$). Other risk factors were diabetes (34%), dyslipidaemia (22%), age > 65 years (20%), alcohol and smoking (20% and 21%), but all are equally distributed among study groups. IHD was present in 10.7% of the stroke patients (**Table - 1**). Overall mortality rate was 10.7% with a significantly poor outcome was associated with hypertension (17.1%) and IHD (31.3%) as per **Table - 2**. Overall survival rate was more in patients with infarct as compared to patients with IC Bleed (93.4% vs 71.4%).

Discussion

Stroke is also a leading cause of morbidly with 20% of survivors requiring institutional care after 3 months and 15-30% remaining permanently disabled [3]. Three types of major strokes are ischemic, hemorrhagic and lacunar strokes. Ischemic variety with cerebral infarction results from thrombosis or brain embolism to cerebral vessels [16]. Ischemic stroke is generally caused by one of three pathogenic mechanisms: large artery atherosclerosis in extracranial and large intracranial arteries, embolism from the heart, intracranial small-vessel disease (lacunar infarcts) [17].

Of all the identified modifiable risk factors for stroke, hypertension appears to be the most important, owing to its high prevalence and its associated three to fivefold increase in stroke risk [18]. Based on epidemiologic data, approximately 50% of strokes could be prevented if hypertension were to be eliminated [19]. Hypertension contributes to each of the major intermediate causes of both ischemic and

hemorrhagic stroke including carotid stenosis, intracranial atherosclerosis, small-vessel arteriosclerosis, and both macroscopic and microscopic aneurysms. In present study, a significant association of hypertension was observed with hemorrhagic stroke (78.6% vs. 44.3%; p< 0.01), which was in accordance with the Inter stroke study [20]

Table – 1: Distribution of risk factors and its association with type of stroke.

Risk factors (n-150)	Ischemic (n-122)		Haemorrhagic (n-28)		Total		p- value
	N	%	N	%			
Age> 65%	22	18.0%	8	28.6%	30	20.0%	**0.29**
Males	100	82.0%	22	78.6%	122	81.3%	**0.78**
Females	22	18.0%	6	21.4%	28	18.7%	
Hypertension	54	44.3%	22	78.6%	76	50.7%	**< 0.05**
DM	43	35.2%	8	28.6%	51	34.0%	**0.65**
Dyslipidemia	27	22.1%	6	21.4%	33	22.0%	**1.0**
Smoking	32	26.2%	0	0.0%	32	21.3%	**< 0.05**
IHD	14	11.5%	2	7.1%	16	10.7%	**0.73**
Tobacco	17	13.9%	5	17.9%	22	14.7%	**0.56**
Alcohol	25	20.5%	5	17.9%	30	20.0%	**1.00**

Table – 2: Association of risk factors with stroke outcome.

Risk factors (n-150)	Died (n-16)		Survived (n-134)		Total		p- value
	N	%	N	%			
Age> 65%	4	13.3%	26	86.7%	30	20.0%	**0.52**
Males	15	12.3%	107	87.7%	122	81.3%	**0.31**
Females	1	3.6%	27	96.4%	28	18.7%	
Hypertension	13	17.1%	63	82.9%	76	50.7%	**<0.05**
DM	6	11.8%	45	88.2%	51	34.0%	**0.78**
Dyslipidemia	6	18.2%	27	81.8%	33	22.0%	**0.12**
Smoking	3	9.4%	29	90.6%	32	21.3%	**1.00**
IHD	5	31.3%	11	68.8%	16	10.7%	**< 0.05**
Tobacco	3	13.6%	19	86.4%	22	14.7%	**0.5**
Alcohol	3	10.0%	27	90.0%	30	20.0%	**1.0**
Ischemic	8	6.6%	114	93.4%	122	81.3%	**< 0.05**
Haemorrhagic	8	28.6%	20	71.4%	28	18.7%	

Diabetes mellitus is a prominent risk factor for cerebral infarction [21]. Diabetes contributes to atherosclerosis of the cerebral arteries and alters cerebral blood flow. It has been associated with both small-vessel lacunar infarction and large vessel stroke [22]. Dyslipidemia is a major risk factor for CAD and ischemic stroke [23, 24]. It causes insulin resistance which results in increased levels of plasma triglycerides and LDL cholesterol and a decreased concentration of HDL cholesterol, as an important risk factor for peripheral vascular disease, stroke, and CAD [25, 26]. Serum HDL cholesterol has anti-atherogenic properties with ability to trigger the flux of cholesterol from peripheral cells to the liver and thus having a protective effect [27].

Cigarette smoking increases the risk of sub-arachnoid haemorrhage by 100% or more, perhaps by increasing the release of proteolytic enzymes that effect blood vessel integrity [28]. Alcohol induced hypertension, relative anticoagulation, or increased cerebral blood flow may be responsible. The association between alcohol and stroke risk appears much stronger for intra-cerebral and sub-arachnoid haemorrhage than for ischemic stroke. Reduction in alcohol consumption may be accompanied by a reduction in the risk of subsequent hemorrhagic stroke [29].

Patients with haemorrhagic stroke are generally considered to be at high risk for mortality compared to patients with infarcts [30]. This is amply demonstrated in this study. Previous studies have linked the excess mortality to the generally more severe strokes in patients with haemorrhagic stroke, whereas stroke type per se was considered of no influence on mortality—the extent of the injury and initial stroke severity was regarded decisive [31, 32]. Chinu D, et al. in their study also concluded that among conscious stroke patients, Intra-cranial haemorrhage is an independent predictor of poor neurologic outcome, nearly doubling the odds of long-term disability [33].

Conclusion

Overall the prevalence of Ischemic stroke was higher than haemorrhagic stroke with maximum number of cases in age group 60 years and above. It was also seen that stroke afflicted higher number of males than females in all age group. Of the modifiable risk factors, hypertension was most common, followed by diabetes, dyslipidemia, cigarette smoking and alcohol use. Preventive strategies aimed at early detection and treatment of hypertension, public awareness about ill effects of cigarette smoking and excessive alcohol use can contribute in reduction of stroke burden. Suitable measures to reduce the stroke risk can be adopted as primary and secondary prevention in these cases.

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