

ORIGINAL ARTICLES

Clinico-radiological profile of strokes in Kashmir valley, North-West India: A study from a university hospital

Parvaiz A Shah MD DM, G Hussain Bardi MD, Bashir A Naiku MD DM, A Khaliq Dar MD, Rakesh K Kaul MD

Neurology Division, Postgraduate Department of Medicine, Government Medical College & Associated S. M. H. S. Hospital (University of Kashmir), Srinagar, Kashmir, (J&K). India

Abstract

Background: Globally, ischemic stroke outnumber hemorrhagic strokes. However, it was observed that hemorrhagic stroke is more common in Kashmir valley. The present study was conducted to substantiate this notion, and to identify the possible risk factors. **Methods:** This prospective study was conducted on 6,906 patients with first ever stroke admitted to S. M. H. S. Hospital, an associated teaching hospital of the Government Medical College, Kashmir, from January 1996 to June 2009. Other than clinical history, examination and routine biochemistry, cranial CT scan (non-contrast) was performed in all the cases within three days of the stroke onset. MRI brain, CSF analysis, screening for cardiovascular disorders, prothrombotic states and collagen profile were performed wherever deemed necessary. **Results:** There was predilection of stroke among the males and rural population. Eighty three percent of patients developed first-ever stroke in sixth and seventh decade. Fifty four percent of cases had a Glasgow coma score of >10 on admission. Intracerebral hemorrhage was observed in 64.7% patients with male preponderance. Putamen (53.5%) was the most common, site of hemorrhage, followed by thalamus (29.7%). Hypertension, smoking and multiple risk factors were observed in 92.3%, 70.3% and 67.9% cases respectively. Poor antihypertensive medication compliance was observed in 55.9% cases.

Conclusions: Intracerebral hemorrhage was the commonest stroke-type observed in Kashmir accounting for close to two third of strokes with male preponderance.

INTRODUCTION

Stroke is the third leading cause of morbidity in the developed world.^{1,2} According to the available literature, it is emerging as a potential public health problem in the developing world as well. Data from many of the developing world pertaining to the epidemiology, clinical profile and risk factors of stroke is compromised by the incomplete medical records, inadequate investigations and other infrastructure. The maiden neuro-epidemiological study from Kashmir valley shows a prevalence of stroke of 1.43/1000 population.³ The valley of Kashmir is situated in northern India between 32°-15' and 37°-5' North latitude and 72°-35' and 80°-20' East longitude. The valley comprises of eight districts with a population of 5.6 million (2001 census). The majority of the population is Muslims, who are homogenous in ethnicity, culture and religion.

There are two referral teaching hospitals for the entire valley. The inadequate medical care facilities in the periphery have been further aggravated by the ongoing militancy related turbulent conditions in the valley during the last two decades. On an average, transportation of the patients from the rural areas to the referral hospitals takes about one to four hours.

Our hospital (S. M. H. S. Hospital), being the oldest and centrally located hospital, receives on an average of four to six stroke patients in the Medical Emergency Department every day. Upon onset of signs and symptoms of stroke, irrespective of severity, majority of patients report to the referral hospital within 24 hours. The patients may seek treatment directly, or after being referred by the primary care physicians or general practitioners. The peripheral hospitals are generally not adequately equipped to manage stroke cases. S. M. H. S. Hospital is a 750 bedded teaching

Address correspondence to: Dr. Parvaiz A. Shah, Consultant Neurologist, H. No:35, Momina-bad, Hyderpora-Bye-pass (east) Srinagar, Kashmir, (J & K), India. 190014. E-mail: parvaizshah11@gmail.com

hospital attached to the Government Medical College, Srinagar (University of Kashmir). It conducts undergraduate and postgraduate teaching in various disciplines of Medicine. The hospital is equipped with Spiral CT Scan, 1.5 Tesla MRI Scan and has a Neurology service staffed by trained Neurologists. The Hospital receives patients from all parts of the valley.

Cerebrovascular accidents constitute the commonest neurological disorder encountered in our Emergency Department. We have previously observed that hemorrhagic stroke is more common than ischemic strokes in this part of the world. We undertake this study to confirm this observation, and to determine the possible risk/etiological factors. The local diet has high salt content.⁴ This, together with poor compliance to anti-hypertensive treatment may contribute to the preponderance of hemorrhagic stroke in Kashmir.

METHODS

This was a prospective study of the first ever stroke admitted to the Medical wards of the S. M. H. S. Hospital, from January 1996 to June 2009. Stroke was defined according to the World Health Organization criteria as rapidly developing signs of focal or global disturbance of cerebral function, lasting > 24 hours or leading to death, with no apparent cause other than vascular.⁵ Ischemic strokes were classified as per Oxfordshire Community Stroke project classification and TOAST classification.^{6,7} Patients residing within the jurisdiction of Srinagar municipal corporation were regarded as from urban area, whereas those from areas outside the Srinagar municipal corporation were regarded as from rural area.

Besides detailed medical history and clinical examination, complete blood count, blood sugar, blood urea, serum creatinine, serum uric acid, lipid profile, urinalysis, chest skiagram and electrocardiogram was done in all patients. Cranial CT Scan (plain) was done in all the cases within three days of the onset of signs and symptoms of stroke. MRI Scan of brain and CSF analysis was performed in selected patients where cranial CT Scan was inconclusive, or a diagnosis other than stroke was considered. MR angiography of intracranial vessels were performed in 9.6% of patients. Evaluation for coagulopathy, collagen vascular disorder, prothrombotic state including antiphospholipid antibody syndrome, protein C/ protein S deficiency or cardiovascular disease was performed in selected patients wherever

deemed necessary. Patients with embolic stroke with subsequent hemorrhagic transformation were considered to have ischemic stroke. Screening for coagulopathy and echocardiography were performed in 1.4% and 26.6% of cases respectively.

The exclusion criteria were: (1) Patients presenting 3 days after the onset of stroke; (2) Patients in whom the diagnosis of stroke was equivocal; (3) Patients with neurological deficit secondary to nonvascular causes such as intracranial space-occupying lesion or brain trauma (subdural hematoma / epidural hematoma / brain contusion); (4) Patients whose neurological deficits completely resolved within 24 hours (Transient ischaemic attack, TIA), or had previous stroke; (5) Patients with intracranial infections like meningitis, encephalitis or brain abscess; (6) Patients in whom neuroimaging was not possible due to various reasons. The study protocol was approved by the Departmental Review Committee and patients were enrolled after informed consent.

RESULTS

A total of 6,906 cases were included in this study. The number of patients was stable from year to year over the 14 years period (Figure 1). There was male predominance with Male: Female ratio of 2.4: 1. Majority of the patients were from the rural area with Urban: Rural ratio of 1: 2.6. Over 83.6% of the patients developed the first-ever stroke in sixth and seventh decade with mean-age of 62.5years (Table 1).

Cranial nerve palsy / hemiplegia, altered sensorium, sensory disturbances and headache were the most common symptoms/signs, seen in 70.4%, 45.5%, 60.8% and 55% of patients respectively, whereas visual obscurations, apraxia / agnosia and vertigo were seen less frequently (Table 2). Glasgow coma score of >10 at presentation was observed in 54.8% of patients.

Intracerebral hemorrhage was found in 64.7% cases with male preponderance followed by lacunar (17.8%) and ischemic (large artery atherosclerosis) strokes (8.8%). Venous infarcts was seen in 0.5% of cases with preponderance in females which was not statistically significant (Table 3). Putamen (53.5%), thalamus (29.7%) and cerebellum (9.4%) were the most common sites of hemorrhage, whereas caudate nucleus hemorrhage was only seen in 0.1% of patients. In large artery ischaemic infarct, lobar involvement was seen in 77.1% of patients. The lacunar infarcts mainly

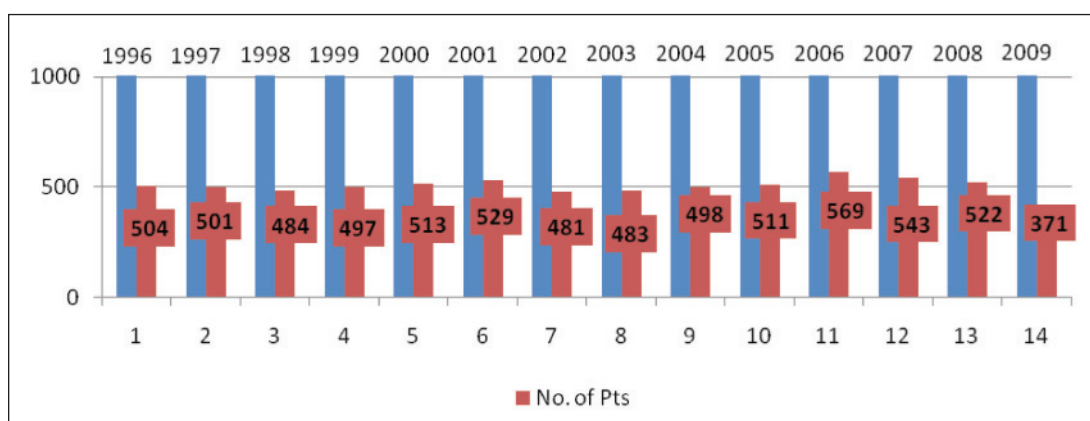


Figure 1: Distribution of stroke cases over the study period (1996-2009)

involved putamen (51.7%) and pons (28.1%) (Table 4).

Hypertension and smoking were the commonest risk factors, found in 92.3% and 70.3% patients respectively, followed by multiple risk factors in 67.9% of patients. Anticoagulant related hemorrhage was seen in 21 (0.3%) patients, whereas intracranial hemorrhage secondary to rupture of AVM was observed in 17 (0.2%) patients (Table 7). Risk factors to venous infarction included puerperium, oral contraceptive consumption, antiphospholipid antibody syndrome and chronic suppurative otitis media.

Young stroke (<40 years of age) was found in 1,064 (15.4%) cases. Comorbid disease/risk factors in this group of patients included rheumatic heart disease, hypertension, smoking and oral contraceptive consumption whereas

no risk/etiological factor was observed in 4.3% cases even after detailed investigations including echocardiography, carotid Doppler study, MR angiography of intracranial vessels, vasculitis profile and screening for any prothrombotic state.

DISCUSSION

Globally ischemic strokes account for about 80% of all stroke patients.¹ This hospital based prospective study in Kashmir, North-West India shows hemorrhagic (intracerebral hemorrhage) to be more common than the ischemic strokes, accounting for close to two thirds (64.7%) of all stroke cases. These results are in contrary to the observations from most stroke studies.^{8-11,15} Nevertheless, there are some other studies from

Table 1: Demographic profile of the stroke patients

Age (years)	Male (n)	Female (n)	Urban (n)	Rural (n)
0-9	----	----	----	----
10-19	----	3	-----	3
20-29	3	6	-----	9
30-39	53	14	38	29
40-49	529	456	9	976
50-59	1302	246	271	1277
60-69	2961	1269	1607	2623
70-79	21	34	13	42
80-89	6	3	3	6
Total	4875 (79.6%)	2031 (29.4%)	1941 (28.1%)	4965 (71.8%)

Table 2: Presenting features of the stroke patients (n=6,906)

Variable	No. of Patients		Stroke-type	
	Male (%)	Female (%)	Hemorrhagic (%)	Ischemic (%)
Headache	1893 (27.4)	1911 (27.7)	3921 (77.4)	415 (22.6)
Vomiting	1587 (22.9)	1623(23.5)	3496 (69)	571 (31)
Vertigo	288 (4.1)	183 (2.6)	367 (7.2)	104 (5.6)
Altered sensorium	2133 (30.8)	1021 (14.7)	2086 (30.2)	1068 (15.4)
Visual obscurations	324 (4.7)	297 (4.3)	423 (8.3)	198 (10.7)
Seizures	1379 (19.9)	1286 (18.6)	2136 (42.1)	529 (28.7)
Cognitive impairment	2796 (40.4)	1857 (26.9)	3871 (76.3)	782 (42.5)
Cranial nerve palsy	4867 (70.4)	1236 (17.8)	4452 (87.8)	1651 (89.7)
Hemiplegia	4867 (70.4)	1236 (17.8)	4452 (87.8)	1651 (89.7)
Speech disturbances	543(8.9)	468 (7.6)	684 (13.4)	327 (17.7)
Sensory disturbances	2863 (41.4)	1341 (19.4)	3982 (76.8)	312 (16.9)
Apraxia / Agnosia	394 (5.7)	82 (1.1)	69 (1.3)	417 (22.6)
Cerebellar Signs	121 (1.7)	55 (10.8)	47 (0.9)	129 (7)

Table 3: Distribution of stroke patients according to stroke-type

Stroke-type	Total (%)	Male (%)	Female (%)	Urban (%)	Rural (%)
ICH	4468 (64.7)	2866 (41.5)	1602 (23.1)	609 (8.8)	3859 (55.8)
SAH	566 (8.2)	262 (3.8)	304 (4.4)	228 (3.3)	338 (4.9)
Ischemic	608 (8.8)	346 (5.1)	262 (3.7)	311 (4.5)	297 (4.3)
Lacunar	1231 (17.8)	918 (13.3)	313 (4.5)	621 (9.3)	610 (8.5)
Venous Infarct	33 (0.5)	6 (0.1)	27 (0.4)	14 (0.2)	19 (0.3)

ICH= Intracerebral hemorrhage, SAH= Subarachnoid hemorrhage

Table 4: Distribution of stroke patients according to anatomical site involved

Stroke-type	Anatomical Location						
	Putamen	Thalamus	Cerebellum	Pons	C.Semiovale	Lobar	C.Nucleus
ICH	2712 (53.5)	1508 (29.7)	479 (9.4)	128 (2.5)	44 (0.8)	22 (0.4)	7 (0.1)
Ischemic	0	0	129 (21.2)	4 (0.6)	6 (0.9)	469 (77.1)	0
Lacunar	637 (51.7)	204 (16.5)	0	346 (28.1)	47 (3.8)	0	0
Venous infarct	0	0	0	0	0	33 (0.5)	0

ICH: Intracerebral hemorrhage, C.Semiovale: Centrum semiovale, C.nucleus: Caudate nucleus, Percent in parenthesis

Table 5: Distribution of ischemic strokes according to the Oxfordshire Community Stroke Project Classification

Stroke Type	No. of Patients	%
TACI	109	1.6
PACI	411	6.0
LACI	1234	17.9
POCI	88	1.3

TACI: Total anterior circulation infarct, PACI: Partial anterior circulation infarct), LACI: Lacunar infarct, POCI: Posterior circulation infarct

Table 6: Distribution of ischemic strokes according to TOAST Classification

Stroke type	No. of patients	%
Large artery thrombosis	608	1.6
Cardio-embolic*	159	2.3
Small artery thrombosis	1231	17.9
Stroke of determined cause	1733	25.1
Stroke of undetermined cause	106	1.5

*Cardio-embolic strokes were included in ischemic stroke group for statistical analysis.

Table 7: Pattern of comorbid disease / risk factors

Variable	No. of patients (%)
Hypertension	6374 (92.3)
Diabetes mellitus	1422 (20.6)
CAD	1139 (16.5)
RHD	41 (0.6)
Hyperlipidemia	2148 (31.1)
Gout/Hyperuricemia	401 (5.8)
Smoking	4855 (70.3)
Alcohol	57 (0.8)
OCPS	113 (1.6)
Anticoagulants	21 (0.3)
Vasculitis	27 (0.4)
Pregnancy/Purperium	27 (0.4)
Migraine	6 (0.1)
Poor drug compliance	3861 (55.9)
Multiple risk factors	4696 (68.0)

CAD: Coronary artery disease, RHD: Rheumatic heart disease, OCP: Oral contraceptives, Poor drug compliance for antihypertensive

Asia that also reported hemorrhagic strokes to be more common.^{12-14,16,19} Banerjee *et al*¹² found hypertension as the commonest risk factor for haemorrhagic strokes whereas Wei *et al*¹⁹ found an inverse relationship between haemorrhagic stroke and diabetes mellitus, dyslipidemia and body mass index. It is interesting to note that in our patients, lacunar infarct was the next most common stroke type to cerebral hemorrhage, where small vessel disease is the common underlying pathology in both these stroke subtypes.¹⁷

Hypertension, the commonest and multiple risk factors were encountered in 92.3% and 67.9% cases respectively. These observations are in conformity with the results from other studies from developing as well as the developed world.^{9,11-16} Prevalence of hypertension in this part of the world is 20%. It has been observed that majority of the hypertensive patients do not strictly adhere to the antihypertensive therapy. Moreover, people of Kashmir consume salt tea (locally known as Namkeen tea) which is a mixture of boiled tea leaves, milk and salt. An average Kashmiri consumes 6 to 8 cups of salt tea per day. Besides this, common salt is added to the cooked food in order to enhance taste and flavor. Average consumption of salt by an adult Kashmiri is 8-12 grams per day.⁴

Other than poor compliance to antihypertensive treatment and higher consumption of salt, it is interesting to speculate whether cold Kashmir climate (which can induce vasospasm) contribute to the preponderance of hemorrhage stroke. This postulation needs further investigations.

Data from countries with climate similar to that of Kashmir did not reveal any preponderance for hemorrhagic strokes. An epidemiological study from Russia showed ischemic stroke to be the commonest with hypertension, coronary artery disease and smoking as the prime risk factors.¹⁸ Similarly, a multicentre study from China recorded an interregional variation in the frequency of hemorrhagic strokes which was ascribed to distribution of various risk factors for stroke.¹⁹

Other considerations are early onset cerebral amyloid angiopathy, which is negated by the fact that in majority of our patients' hemorrhage occurred in the basal ganglion rather than in cerebral cortex which is the common site of hemorrhage in amyloid angiopathy. There is no autopsy study on the occurrence of cerebral amyloid angiopathy in Kashmir till date. Genetic predisposition is another possible factor which requires further study.

Other comorbid diseases and risk factors like

diabetes mellitus, coronary artery disease, rheumatic heart disease, dyslipidemia, hyperuricemia, vasculitis, migraine, alcohol/ oral contraceptive/ anticoagulant consumption were observed less frequently.

The present study is important in the sense that it represents a large sample size over more than a decade and thus can depict pattern of strokes and their risk factors in this region. Although this is a hospital-based study, yet we believe that it truly represents a cross-section of stroke patients as there is a tendency among almost all stroke patients locally, irrespective of the severity of their illness, to seek treatment in the tertiary care center. The fact that more than half of our patients had Glasgow coma score of >10 on admission also support this proposition.

DISCLOSURE

Conflict of interest: None

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