

Clinico-radiological profile of stroke in eastern Nepal: A computed tomographic study

Naik M¹, Rauniyar RK¹, Sharma UK¹, Dwivedi S², Karki DB¹, Samuel JR¹

¹Department of Radiodiagnosis and Medical Imaging ²Department of Internal Medicine, BP Koirala Institute of Health Sciences, Dharan, Nepal

Abstract

Aim: Stroke is a frequent cause of death and disability in elderly patients. This study was carried out to establish the pattern of various types of cerebrovascular accident (CVA) in eastern Nepal and to correlate the clinical data and radiological findings in cases of stroke.

Materials and methods: All the patients clinically diagnosed as stroke and referred to the radiology department for Computed tomography (CT) of the brain over a period of 1 year were included.

Results: There were 150 patients with stroke (104 males and 46 females), aged 7 to 91 years in which infarction (58%) was more common than haemorrhage (42%) in both group of age (≤ 40 years and > 40 years). Smoking was the commonest risk factor noted in 40.66% cases followed by hypertension (40%). Excessive meat consumption (more than 4 times a week) was seen in 69.1% cases. In early Middle Cerebral Artery (MCA) territory infarction presenting within six hours of onset, positive CT findings were seen in 40% cases among which, obscuration of the lentiform nuclei was diagnostic.

Conclusion: In this part of Nepal, infarction is more common than haemorrhage as the cause of stroke and in contrary to western population; hemorrhagic stroke constitutes a significantly higher proportion of stroke. Smoking is the commonest risk factor followed by hypertension and it is also seen in combination with alcohol in many cases. Excessive meat consumption could be an additional risk factor for stroke in this part of Nepal. In younger age group (≤ 40 years), haemorrhage is more common than infarction and alcohol consumption is the commonest risk factor.

Key Words: Computed tomography, stroke, CVA

Stroke is defined by the WHO as "The rapidly developing clinical symptoms and signs of focal (at times global) disturbance of cerebral function with symptoms lasting more than 24 hours or leading to death with no apparent cause other than that of vascular origin."¹

The four major types of stroke are cerebral infarction, intracerebral haemorrhage (ICH), primary subarachnoid haemorrhage (SAH) and venous occlusion. Cerebral infarction is due to significantly diminished blood flow to all parts of the cerebral hemisphere (global) or selected areas (regional or focal) of the brain.

Among the stroke subtypes, cerebral ischemia and infarction constitute about 85-90% of the total stroke subtypes in western countries with only about 10-15% patients with cerebral haemorrhage.² But contrary to the western population, hemorrhagic stroke constitutes a larger percentage of stroke subtypes on this side of the globe as seen in countries like Japan and China probably because of poorly controlled hypertension.³

CT scan is a widely available, affordable, non-invasive and relatively accurate investigation in patients with stroke and is the modality of choice as an initial investigation in patients with stroke. The purpose of CT is to differentiate ischaemic stroke from ICH and to rule out other pathological processes such as tumour, which may present as stroke. The reasons for the greater burden of stroke in Eastern Asian population remain unclear and direct reliable evidence about the determinants of stroke in this region is therefore needed.

This study is the first of its kind in Eastern Nepal and has been carried out to obtain an initial data regarding the types of stroke in this region and the importance of specific risk factors. The collected and interpreted data has been planned so as to provide as in depth idea about the clinical and radiological profile of patients suffering from stroke in this region.

Correspondence

Dr Umesh K Sharma,
Asst. Professor, Deptt. of Radiodiagnosis
Kathmandu University Medical School, Dhulikhel, Nepal
email: druksharma@hotmail.com

Materials and methods

All the clinically diagnosed cases of stroke referred for CT scan head examination were included in the study over a period of one year (April 2001 - April 2002). Only those patients having first ever stroke and giving history of onset less than 10 days were included. The reason being that after 7-10 days intracerebral haematoma may become ISO to hypodense and then it is difficult to differentiate from an infarct on non-contrast scan.³

History about potential risk factors was obtained based on standard criteria which included history of past or current alcohol consumption, smoking, tobacco chewing, hypertension, diabetes mellitus, obesity and cardiovascular disease. Based on history and all the clinical examination findings, clinical diagnosis was made.

The patient was then subjected for non-contrast CT scan of the head on the Siemens Somatom AR star with initial 3 x 3 mm axial scans for the posterior fossa and 8 x 8 mm sections for the rest of the brain. Whenever required additional thinner cuts were taken.

After this the data was tabulated and statistically analysed and the clinical features and various risk factors were correlated with the CT findings. Relationship between various risk factors and types of stroke were evaluated with special reference to patients less than 40 years of age and those more than 40 years.

Results

A total of 150 patients clinically suspected of having CVA were included in the study. Among 150 cases, 87 were infarction (58%) and 63 were haemorrhage (42%) of which 3 were primary SAH. Out of 150 cases 104 (69.33%) were males and 46 (30.66%) were females. In this study infarction was commoner in both males and females (65.2%).

The age of the patients ranged from 7 - 91 years, with a mean age of 58.27 years (SD-16.02). The patients were divided into two groups, those aged ≤ 40 (stroke in young)⁵ and those aged > 40 years. In our study, stroke in the young was seen in 19 cases (12.66%), out of which haemorrhage was seen in 11 (57.8%) and infarction in 8 (42.1%). Among patients aged > 40 years, infarction was seen in 79 cases (60.3%) and haemorrhage in 52 cases (39.6%).

In the 19 cases of stroke in the young, aged 7 to 40 years there were 10 males and 9 females. Out of 19 cases, 7 (36.8%) had a history of alcohol intake, 3

(15.7%) were smokers, 4 (21.33%) gave a history of tobacco chewing, 2 (10.5%) were untreated hypertensives, and there was one case each of miliary tuberculosis, haemophilia and rheumatic heart disease.

Dietary history revealed 23 patients as pure vegetarians (15.333%), 20 ovo-vegetarians (13.33%) and 107 were non-vegetarians (71.33%). The most commonly consumed meat was chicken and most patients (69.1%) had non-vegetarian food for 5-6 days a week.

Risk factors

Risk factors were present in 141 cases and absent in only 9 cases. Multiple risk factors were seen in 99 (70.2%) cases and more than 3 risk factors in 42 (29.7%) cases.

Among the various risk factors included, the commonest was smoking in 61 cases (40.66%) followed by hypertension in 60 cases (40%), obesity in 51 cases (34%). History of alcohol intake was seen in 46 cases (30.66%) and tobacco chewing in 43 cases (28.66%). Diabetes mellitus was found in 10 cases (6.6%) and heart disease in 9 cases (6%). Among multiple risk factors, a combination of alcohol intake and smoking was commonest in 38 cases.

Clinical presentation and findings

The clinical diagnosis of whether infarction or haemorrhage was incorrect in 25 cases (16.66%) and correct in 125 cases (83.33%). In the 150 cases, correct clinical localization of the lesion was made in 70 cases (46.66%) out of which, 45 were infarctions and 25 were haemorrhage. Clinical presentations of cases were hemiplegia (49.3%), loss of consciousness (37.3%), isolated cranial nerve involvement (2.6%) and other (10.6%). A total of 56 patients presented with loss of consciousness out of which 32 had haemorrhage (57.1%) and 24 had infarction (42.9%).

The patient's level of consciousness was determined by the Glasgow coma scale (GCS). It was noted that poor GCS was associated with haemorrhage rather than infarction. Out of the 63 cases of haemorrhage, 6 had GCS ≤ 5 , 37 had GCS 5-10 and 20 had GCS > 10 . Whereas in 87 cases of infarction, 54 had GCS > 10 , 33 had GCS 5-10 and none had GCS ≤ 5 . In patients with haemorrhage, poor GCS was seen in cases having intraventricular extension and midline shift.

Cranial nerves were involved in 97 cases out of which the commonest cranial nerve involved was the

7th (facial) nerve (72 cases). The next common cranial nerves involved were the 9th (Glossopharyngeal)-14 cases and 11th (accessory)-4 cases.

CT scan findings

Out of 150 patients, 12 were normal on first CT scan done within 6 hours of onset of stroke and later follow up scan done after 12 hours showed infarction, i.e. a positive detection of CT scan within 12 hours was 100%. Out of 87 cases of infarction, MCA territory was involved in 67 cases (77%). Posterior cerebral artery (PCA) territory was involved in 10 cases (11.49%). Anterior cerebral artery (ACA) in 6

cases (6.8%), basilar artery branches in 4 cases (4.5%). Combined involvement was seen in 14 cases of which MCA & ACA was common.

Out of the 67 cases of MCA infarction, 20 cases (12 males and 8 females aged 50 to 80 years) presented within 6 hours of ictus. Left side was involved in 11 cases and right side in 9 cases. In the first scan, obscuration of the lentiform nucleus was seen in 5 cases (25%), 12 cases (60%) were normal and in 3 cases (15%) doubtful hypodensity was noted. Later follow up scan was done after 12 hours of onset in 17 cases showed MCA territory infarction.

Fig 1: Cerebellar infarct. Ill defined hypodensity in left cerebellum extending up to the fourth ventricle.

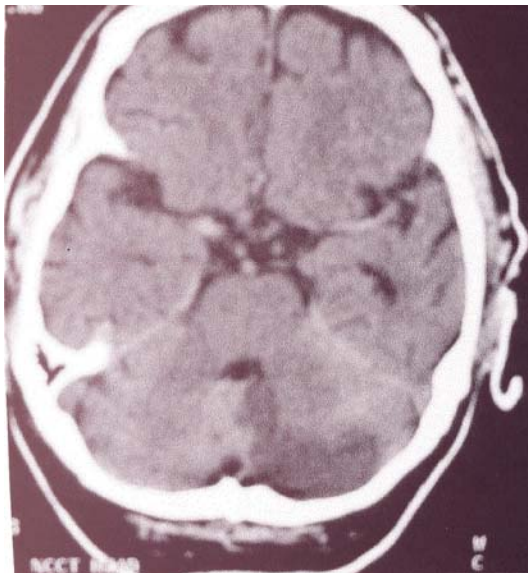
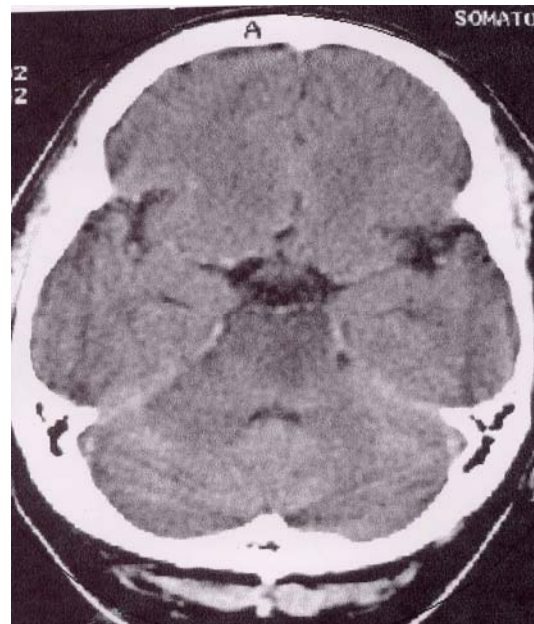


Fig 2: Basilar artery territory infarct. Hypodensity noted in brain stem.



Out of 87 cases of infarction, 20 (22%) cases had a single lacunar infarction (size<2cm) and in 2 cases multiple lacunes were noted. Regional involvement of lacunar infarcts was internal capsule (68.1%), basal ganglia (27.2%) and thalamus (13.6%).

Out of 67 MCA infarctions, the hyperdense MCA sign was seen in 2 patients (2.9%). In both cases, MCA territory was indicating this sign to have 100% specificity.

Haemorrhage was seen in 63 cases, out of the total 150 cases of stroke. The commonest region affected was the basal ganglia & internal capsule and thalamus in 34 cases (53.96%) followed by temporo-parietal region in 22 cases (34.4%). Posterior fossa bleed was noted in 7 cases (11.11%) out of which 3 were cerebellar and 4 in the brainstem. Out of 34 cases having haemorrhage in the basal ganglia and internal capsule region, 20 were hypertensive.

Discussion

CVA is a frequent cause of death and disability and is a major problem in most part of the world.⁴ After heart disease and carcinoma, stroke is the third leading cause of death in developed countries.⁴ Sotaniemi K A et al in 1990, in a series of 154 patients with CVA found that, 30 (19.5%) were ICH, 16 (10.4%) were SAH and 102 (66.2%) were infarcts. In our study also, infarction was commoner than haemorrhage. Out of 150 cases, 87 (58%) were infarcts and 63 (42%) were haemorrhage. Further, it was seen that, haemorrhage was more common (57.8%) than infarction (42.1%) in untreated hypertensives whereas in treated cases, infarction was more common (54.5%) than haemorrhage (45.5%).

Various studies have shown that the clinical differentiation between haemorrhage and infarction is not always accurate because small haematomas may cause symptoms and signs that are identical to those caused by infarcts.^{7,8,9,10} It is not always possible to infer the exact site and size of the lesion in the motor pathway based on the clinical presentation. In the study done by Sotaniemi K A et al,⁶ the clinical picture did not agree with the CT localization of infarction in 11.7% of cases. The clinical picture and CT localization were compatible in 80 (94.1%). Clinical differentiation between haemorrhage and infarction was possible in 81.8%. In our study, the clinical differentiation between infarction and haemorrhage was correctly made in 125 cases (83.33%). In the 87 cases of infarction, clinical localization of the lesion was made in 45 cases (39.68%). Localization was even more difficult in haemorrhage. Out of the 63 cases of haemorrhage, correct localization of the lesion was made in 25 cases (39.68%). Thus out of a total of 150 cases, correct clinical localization was possible in only 46.66%. The reasons for this poor clinical localization could be that there is a lot of overcrowding of patients in both the emergency and outpatient department and many patients do not undergo a detailed clinical examination and also, junior residents who are still under training examine most patients.

Potential risk factors for stroke include cardiac disease, hypertension, smoking, diabetes mellitus and alcohol abuse.¹¹ While hypertension, smoking and cardiac disease are established risk factors,¹² newer risk factors are being reported and their association and relative risk is still being ascertained. Obesity as a cause for stroke has insufficient supporting data. However, obese persons have higher levels of blood pressure, glucose and atherogenic serum lipids and

on that account could be expected to have increased stroke incidence.¹³

In 1994 Konrad Jamrozik et al¹⁴ studied the role of lifestyle factors in the aetiology of stroke. They found that consumption of meat more than 4 times weekly was an additional risk factor associated with increased risk for all first ever stroke. In our study, out of 150 patients, 107 (71.33%) were non-vegetarians and out of these 107, 69.1% of patients consumed meat 5-6 days a week. Consumption of excessive meat thus could be an additional risk factor in our part of Nepal and deserves further evaluation. In the study by Horowitz SH et al in 1992,¹⁵ the risk factors for stroke were hypertension (58%), smoking (28%), diabetes (20%) and alcohol abuse (4%).

Jose Luis Ruiz-Sandoval et al⁵ in 1999 retrospectively evaluated 200 patients of stroke. They reported common risk factors for stroke as tobacco use in 20%, hypercholesterolemia in 35%, hypertension in 13% and alcohol use in 10%. In the study by Kaul S et al¹⁶ in 2000, common risk factors in stroke were hypertension in 62%, diabetes mellitus in 38% and smoking in 28%. In the present study, risk factors were present in 141 cases and absent in 9. Out of these 141, 85 (60.2%) were males and 56 (39.7%) females. The commonest risk factor was smoking (40.66%) followed by hypertension (40%), obesity (34%), alcohol intake (30.6%). Tobacco chewing comprised 28.66% and diabetes mellitus in 6.6%. Heart disease was noted in 6% cases.

It is traditionally believed that ICH is more closely associated with hypertension than infarction but the Framingham study showed¹⁷ that the incidence of atherothrombotic lesions also closely correlated with blood pressure levels. In our study, haemorrhage was more common in untreated hypertensives (57.8%), moderate alcohol consumption (61.5%), tobacco chewers (60.46%) and untreated diabetics (75%).

The visualisation of an ischemic infarct on CT scan, depends greatly in the timing of the investigation.^{18,19,20} Unenhanced CT performed approximately 3 days after infarction have been reported to be sensitive.²¹ The clearance of cerebrospinal fluid (CSF) affects the detection of SAH as time progresses after the onset. The probability of recognizing SAH on CT is 85% after 1 week, 30% after 2 weeks and almost nil after 3 weeks.²² In our study, CT confirmed the presence of cerebrovascular lesion in 92% of cases in the first scan. Out of 87 infarctions, CT was positive in 75(86.2%) in the first scan. Presence of SAH was detected in all 11 patients

with 100% accuracy. This could be because out of 11 cases, 9 presented within 24 hours and 2 presented after 36 hours but within 48 hours of onset. In infarctions (87cases) the CT scans were performed within 6 hours of onset in 20 patients (22.8%), within 12 hours in 10 patients (11.4%) and after 24 hours in 57 patients (65.5%).

The commonest vascular territory involved was the MCA territory (77%) followed by the PCA (11.49%) and the ACA (6.8%). The basilar artery territory was involved in 4.5% of cases. In a study by Kazui et al²² 75% cases MCA infarction, 13% ACA and 8% PCA which is comparable to our study. In one study, on lacunar infarction by Kaul S et al¹⁶ in 2000, the presenting symptom was pure motor hemiparesis in 45%, ataxic hemiparesis and sensorimotor stroke in 18% each and dysarthria clumsy hand syndrome in 14%. The common risk factors included hypertension (62%), diabetes (38%) and smoking (28%). 6 patients had underlying cardiac source of embolism. In the present study, out of 87 cases of infarction, 20 (22%) cases of single lacunar infarction and 2 (2.2%) cases of multiple lacunar infarcts were seen. Males (15cases 68%) were common than females (7 cases 31.8%). 18 cases were more than 40 years of age. 2 cases (one 9-year old female and one 26-year old male) were less than 40 years age.

Inoue et al¹⁸ reported a detection rate of 21.4% for ischemic strokes within 6 hours. 'Insular ribbon' includes the Island of Reil, external capsule and the claustrum. The CT finding of obscuration of the lentiform nucleus is caused by cerebral oedema arising in the basal ganglia region. Tomura et al²³ studied the CT findings in cases with early cerebral infarction. The most common finding was an obscured outline or partial disappearance of the lentiform nucleus, which was found in 23 patients (92%). The next most common finding seen in 60% patients was slight decrease in tissue density.

The incidence of ICH in people aged less than 35 years has been estimated to be 100 000 per year.²⁴ The etiologic spectrum of haemorrhage in the young may be wider than in older individuals and includes vascular malformation, hypertension and drug use.²⁵ Most strokes in the young are ischemic. High prevalence of stroke in younger population is characteristic to many studies.²⁶ Hypertension, smoking, hyperlipidaemia were significantly more prevalent in the 31-45 years age group, compared to the 15-30 year age group. In our study, there were 19 cases of stroke in the young, the age of the patients ranged from 7 to 40 years. Haemorrhage was common in (57.8%) than infarction (42.1%). Out of 19 cases, alcohol consumption was commonest. 7

(36.8%) were having a history of alcohol intake, 3 (15.7%) were smokers, 4 (21.3%) gave a history of tobacco chewing, 2 (10.5%) were untreated hypertensives.

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