Short Communication

A Study on Stroke and its Outcome in Young Adults (15–45 Years) from Coastal South India

Harsha Kumar HN, Babusha Kalra[1], Nayna Goyal[1]

Department of Community Medicine, Kasturba Medical College, [1]Kasturba Medical College, Mangalore, Karnataka State, India

Introduction

Stroke is an important cause of disability among adults and is one of the leading causes of death worldwide.[1] A higher proportion of younger individuals suffer from stroke among developing countries as compared with developed countries.[2] Data from India on stroke among the young are mostly limited to ischemic stroke.[3-5] There is paucity of information on stroke in young individuals covering important types of stroke.[6] Therefore, we conducted a study to study the profile of stroke cases among young adults admitted in one of the tertiary referral centers of Karnataka state.

Materials and Methods

This is a retrospective, record-based study of patients of stroke in the age group of 15–45 years admitted to two referral hospitals of Kasturba Medical College, Mangalore. The patients were identified from the medical records, starting from January 1998 to June 2008. Consent was sought for accessing the medical records. One hundred and nine patients fulfilled the WHO definition of stroke.[7] Important subtypes of stroke were included (i.e., ischemic, hemorrhagic, embolic). Patients who presented with drop attacks and loss of consciousness due to other causes were excluded. The following information was noted in a semistructured proforma: the sociodemographic patient characteristics (like age, sex and occupation), presenting symptoms, risk factors present (like hypertension,[8] diabetes mellitus,[9] smoking, alcoholism, family history, cardiac disease and dyslipidemias[10]), investigations performed and outcome following stroke.

Access this article online

Quick Response Code:

Website: www.ijcm.org.in

DOI: 10.4103/0970-0218.80798

Stroke subtypes

Cardioembolic: presence of potential cardiac sources of embolism as documented from the ECHO cardiograph.

Hemorrhagic stroke: as documented from the cranial computerized tomography (CT) scan.

Ischemic stroke: supported by axial CT or digital subtraction angiography.

Outcome of stroke

The cases were categorized into the following classes based on Activities of Daily Living (ADL):

Class 1: no significant disability or can independently perform the ADL.

Class 2: slight disability or able to carry out ADL without assistance.

Class 3: moderate disability or able to carry out ADL or walk with assistance.

Class 4: severe disability or unable to carry out ADL or walk without assistance.

Class 5: dead.[11]

Analysis

The data were fed into SPSS version 12 and analyzed. A chi-square test was used to determine whether the differences observed were statistically significant. A *P*-value <0.05 was considered to be significant.

Results

Of the 109 cases of stroke, 61 (56%) were ischemic stroke, 25 (22.9%) were hemorrhagic stroke and 23 (21.1%) were embolic stroke. Depending on the subtype, the numbers

Address for correspondence:
Dr. Harsha Kumar H N, Associate Professor, Department of Community Medicine, Kasturba Medical College, Near Hampanakatta, Mangalore - 575 001, Karnataka State, India. E-mail: drhnhk@rediffmail.com

Received: 18-12-09, **Accepted:** 12-08-10

Table 1: Number of patients who were investigated and numbers with abnormal reports

Investigations performed	Numbers who were investigated (%)	Numbers with abnormal reports (%)
Lipid profile	68 (62.4)	56 (82.3)
Blood sugar	109 (100)	59 (54.1)
Platelets and coagulation parameters	34 (31.2)	4 (11.8)
Serum homocysteine	7 (6.4)	7 (100)
ECHO cardiography	94 (86.2)	49 (52.1)
Cranial CT scan	70 (64.2)	23 (32.8)
Digital subtraction angiography	26 (23.8)	7 (26.9)

of case who underwent various investigations along with the proportion of those with abnormal reports are given in Table 1.

Demographic characteristics

Overall, there is male preponderance (74 out of 109) in all subtypes of stroke. Stroke is more common (78 out of 109) among the 31–45 years category as compare with the <30 years category. The occupational distribution did not show any pattern: students (3), unskilled (20), semiskilled (24), business (28) and professionals (34). Professionals included bank employees, managers and engineers in private companies.

Symptoms and disability

Cases of embolic stroke mostly presented with loss of power in the limbs. Mostly (12 cases), they woke up in the morning and noticed loss of power. Headache was more common among hemorrhagic stroke, and it occurred in the evenings, between 4 pm and 6 pm. No pattern could be observed in the headache occurring among cases of ischemic stroke. Vomiting and seizures were more common among hemorrhagic stroke than in the other stroke subtypes.

The disabilities observed were: monoplegia (right lower limb [2], left lower limb [1], right upper limb [4], left upper limb [2]) and hemiplegia with upper motor neuron facial palsy (right [16], left [5]).

Risk factors

There were 76 (69.7%) smokers, 53 (48.6%) alcoholics, 59 (54.1%) diabetics and 79 (72.5%) hypertensives. Family history of stroke was present in 42 (38.5%) patients. Using the body mass index (≥25) criteria, 53 (48.6%) were overweight, of which 20 (18.3%) were males. Abnormal platelets and coagulation parameters were found in four cases, all of which had hemorrhagic stroke. Elevated homocysteine was found in three cases, all of which had ischemic stroke. Single risk factor was present in 57 (52.2%) patients, two risk factors in 68 (62.4%) and three or more risk factors in 79 (72.5%) patients. Twelve cases did not have any known risk factor. Mortality was lower (8, 7.3%) than disability (60, 55%), and 41 (37.6%) had good outcome. The distribution of patient characteristics/risk factors according to stroke subtype is given in Table 2.

Investigation results

ECHO revealed the following abnormalities: hypertensive heart disease (28), rheumatic heart disease (RHD) (14), cardiomayopathy (4) and aortic stenosis (3). The involvement of mitral valve (regurgitation [6], stenosis [5]) was more common among the RHDs .

Cranial CT scan: Involvement of the middle cerebral artery territory in 18 patients was the most common finding. Digital subtraction angiography revealed abnormalities in seven (stenosis [4], occlusion [3]) patients.

Discussion

There is one comparable study from India performed on all subtypes of stroke in young adults[1] that also found that ischemic stroke was the most common subtype followed by hemorrhagic and embolic. Overall, there is a male preponderance of stroke. Studies performed on ischemic stroke among the 15–45 years age group from India also reported a male preponderance.[3,4] Similar findings have been reported from Denmark in cases of thromboembolic stroke.[12] A higher proportion of males was found among cases of ischemic stroke in studies outside India.[13,14] The proportion of cases is higher in the 31–45 years age group, which is similar to the findings reported by Nayak *et al*.[3] No pattern could be observed among occupation, although the proportions (56.8%) in sedentary (professional, business) occupation outnumbered the more physically active occupations (40.3%). No comparable findings were reported from Indian studies.

Presenting symptoms similar to those in our study have been reported by Chopra and Prabhakar[15] and Nayak *et al*.[3] Although day time onset is reported to be more common,[3,16,17] we could not find such a difference. The proportion of nonischemic strokes (44%) is slightly less than ischemic strokes (56%). Cases of ischemic stroke had a day time onset (43 out of 61), and no pattern could be observed in nonischemic stroke. This could have accounted for the differences.

Smoking, alcoholism and hypertension have been found to be significantly associated with ischemic stroke,[3,4,18] and in all subtype strokes[6] from India, which is similar to our finding. Diabetes mellitus is reported to be a risk factor for ischemic stroke from India[4] and Switzerland,[18] which was not found in our study. Diabetes was not found to be a risk factor for

Table 2: Distribution of patient characteristics/risk factors according to stroke subtype

Patient characteristics risk factors (*n* = number who were investigated)	Stroke subtype (%)			Chi-square (*P*)
	Ischemic	Hemorrhagic	Embolic	
Age (years)				
15–25	4	2	16	27.98* (<0.000)
26–35	11	4	4	
36–45	46	19	3	
Sex				
Male	46	15	13	7.88 (0.019)
Female	15	10	10	
Smoking (76)				
Yes	47	18	11	6.84 (0.03)
No	14	7	12	
Alcoholism (53)				
Yes	31	17	6	8.51 (0.01)
No	30	8	17	
Hypertensive (79)				
Yes	44	23	12	9.44 (0.008)
No	18	2	11	
Diabetes mellitus (59)				
Yes	31	13	15	1.45 (0.48)
No	30	12	8	
Overweight/obesity (53)				
Yes	28	19	6	12.36 (0.002)
No	33	6	17	
Family history of stroke (42)				
Yes	19	16	7	8.89 (0.01)
No	42	9	16	
Hypercholesterolemia (38)				
Yes	23	14	1	§
No	6	1	3	
Hypertriglyceridemia (14)				
Yes	6	8	-	
No	1	1	-	
Combined dyslipidemia (4 out of 56)				
Yes	--	4	--	
No		--		
Homocystienemia (7)	3	---	---	†
Outcome of stroke				
Class I	30	4	7	13.16** (0.001)
Class II	17	5	8	
Class III	8	9	3	
Class IV	5	3	2	
Class V	1	4	3	

*Age groups were clubbed into two categories, i.e. 15–30 years and 31–45 years. §In spite of clubbing all the categories, the numbers were not adequate for analysis. †Not applicable.
**Classes I and II were clubbed and compared with Classes III, IV and V

ischemic stroke in Sweden[19] and Taiwan.[20] Lipska *et al*.[4] have reported that diabetes is not a risk factor for stroke when compared with hospital-based controls. Apart from differences in patient profile (all subtypes, i.e. our study vs. ischemic stroke), there does not seem to be a consistent association between diabetes and stroke in studies conducted in various countries. Hypercholesterolemia and hypertriglyceridemia are known to be associated with stroke in young adults.[18,20] Lipska *et al*.[4] did not find such an association in south Indian patients. The proportion of patients who did not have an abnormal lipid profile was so low in this study that we could not undertake a meaningful analysis. The role of elevated homocysteine levels requires further investigation in the Indian setting, although its association was reported from the USA.[21] A majority of the investigated cases had normal platelets and coagulation parameters, indicating that it is not an important cause of stroke in young adults. A majority of the cases had good outcome and low mortality, which is comparable with other Indian studies.[3,15]

There are some limitations in our study. Apart from inadequate numbers (in spite of including 10 years records), not all the patients underwent all the investigations, thereby making analysis and interpretations difficult. Being a tertiary care center, the referred patients' profiles may not be representative, creating a bias. Because of paucity of information, this study gives an idea of the sample size required to

undertake more detailed studies with bigger sample sizes to explore the associations and risk factors.

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How cite this article: Harsha Kumar HN, Kalra B, Goyal N. A study on stroke and its outcome in young adults (15-45 Years) from coastal South India. Indian J Community Med 2011;36:62-5.

Source of Support: Nil, **Conflict of Interest:** None declared.