Original article:

Cross sectional study to assess the prevalance, presenting features and factors affecting outcome of stroke

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Abstract:

Background: More than two-third of the global burden of stroke is borne by the developing countries, where the average age of patients with stroke is 15 years younger than in developed countries. . Among survivors of stroke who comprise at least 0.8% of general population, at least half are permanently disabled and stroke is fatal in 1/3 rd of cases. This study was done to find out the clinical profile of stroke in a tertiary care centre India and to determine the subtype of stroke, focal neurological deficit, risk factors and outcome of stroke patients in our hospital

Method: A prospective hospital based study in patients with a diagnosis of stroke using both clinical criteria and CT scan findings was carried out.

Results: The major predisposing factors noted were dyslipidemia, hypertension, diabetes, ischemic heart disease and old cerebrovascular accident accounting for 86%, 71%, 49%, 16% and 14% respectively. The major risk factors were smoking and alcohol accounting for 44% and 17% respectively. In our study 97% of patients survived & 3% expired. Only 3 cases (4%) made full recovery without any neurological deficit. Maximum mortality rate in our study is found to be in age group > 60 years. There is a significant relation between final outcome and type of stroke with hemorrhagic stroke having significant mortality rate of 15.4%.

Conclusion: Hospital data indicating stroke prevalence might not indicate the prevalence of stroke in the community and more studies are needed. Our study showed high incidence of completed stroke in the young and a relatively higher incidence of hemorrhagic stroke though thrombotic strokes were most common. Our study shows uncontrolled hypertension as the major cause of stroke and higher incidence of disabling stroke compared to western countries. There is a need of increased use of preventive treatment such as aspirin, antilipids, antihypertensive, decreased alcohol consumption and cigarette smoking and use of stroke units.

Introduction:

Stroke, defined by the World Health Organization as "rapidly developing signs of focal or global disturbance of cerebral or intracranial neuronal function with symptoms lasting for more than 24 hours or leading to the death of the patient with no apparent cause other than that of vascular origin" (1) is a major cause of death worldwide, second only to ischemic heart disease (2). Asians have a lower rate of Coronary heart disease and a higher prevalence of stroke (3). In one report the age standardized, gender-specific stroke mortality rate was 44 to 102.6/100,000

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for Asian males, compared with only 19.3 for Australian white males (4). Stroke is the leading cause of neurological disability in adults (4, 5). Stroke is also a leading cause of morbidity and mortality in adults in the productive ages that contribute the work force of the society (6). More than two-third of the global burden of stroke is borne by the developing countries, where the average age of patients with stroke is 15 years younger than in developed countries (7). Stroke is fatal in one-third of cases. Among survivors of stroke who comprise at least 0.8% of general population, at least half are permanently disabled, making stroke a major cause of long-term physical, cognitive, social and vocational disability. The mortality and severity of stroke is on the decline in developed countries because of life style modification, increased use of preventive measures such as adequate blood pressure control, increased use of anti- lipid drugs and aspirin (10). This is in contrast to the increasing hospital frequency noted in our environment thus having a great burden on the health facilities in Indian hospitals. This study was done to find out the clinical profile of stroke in Thane, India and to determine the subtype of stroke, focal neurological deficit, risk factors and outcome of stroke patients in our hospital.

Materials and Methods:

A prospective hospital based study was conducted at our centre which is a tertiary care centre for areas in Thane districts after taking a proper written and informed consent from relatives. All the patients with diagnosis of stroke presenting to the Neurology unit of the Kaushalya Medical Foundation Trust Hospital, Thane over a study period (March 2006 to May 2008) were consecutively recruited. Stroke was diagnosed using both clinical criteria and brain CT scan findings (Ischemic/hemorrhagic, Ischemic Stroke Signs: Hyper dense Artery Sign, Loss of Insular Ribbon ("Insular ribbon sign", Loss of cortical gray-white differentiation, Mass effect). Clinical and demographic information were recorded using a structured questionnaire. All the patients with non-stroke pathology on CT scan were excluded from the study. Statistical analysis was done using the SPSS 11.0 Software package. The profile of the patients, stroke sub- type and neurodeficit at onset were reported in percentages.

Investigations done were Hematological and Biochemistry (lipid profile, Hba1c); Radiology: CT scan brain, MRI brain; ECG and Fundoscopy

Data collected included age, sex, risk factors (systemic hypertension, diabetes, hypercholesterolemia, smoking, ischemic heart disease, carotid atherosclerosis) clinical presentation of stroke and earlier lesions in computed tomography (CT) scan of the brain.

Inclusion criteria:

1) Age more than 18 yrs

2) Patients presented with focal neurodeficit that is vascular in origin on CT scan or clinically.

3) Patients with normal CT scan but with focal neurodeficit that appears to be vascular in origin.

Exclusion criteria:

1) Non stroke pathology on CT scan
2) Age less than 18 yrs
3) Patients with history of trauma

Results and Analysis

Seventy patients were managed during the study period. Stroke was responsible for 2.79% (70/2502) of all medical admissions in our centre, the

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prevalence rate comes out to be 2797 per 100000 poplulation. There were 52(74%) male and 18 (26%) female patients studied, with a male to female ratio of 2.8:1.

The duration of hospital admission ranged between 1 to 23 days with a mean of 7 days.

Table 6 : Risk factors for Stroke

The major predisposing factors noted were dyslipidemia, hypertension, diabetes mellitus, ischemic heart disease (atrial fibrillation) and old cerebrovascular accident accounting for 86%, 71%, 49% , 16% and 14% respectively. The major risk factors were smoking and alcohol accounting for 44% and 17% respectively.

Results

Seventy patients were managed during the study period. Stroke was responsible for 2.79% (70/2502) of all medical admissions in our centre, the prevalence rate comes out to be 2797 per 100000 population. There were 52 male (74%) and 18 female (26%) patients studied, with a male to female ratio of 2.8:1.

The duration of hospital admission ranged between 1 to 23 days with a mean of 7 days.

Table 1 : Age distribution in cerebrovascular accident patients

Age(years)	18-20	21-40	41-60	61-80	>/=80
Male	1	3	13	34	1
Female	1	1	06	10	0
Total	2	4	19	44	1

Table 2: Age (mean, standard deviation)

Sex	**Mean**	**N**	**Std. Deviation**
Male	**62.00**	**52**	**14.586**
Female	**61.28**	**18**	**17.248**
Total	**61.81**	**70**	**15.187**

The ages ranged between 18 to 82 years with a mean of 62 years. Over half of the patients affected were between 61 and 80years

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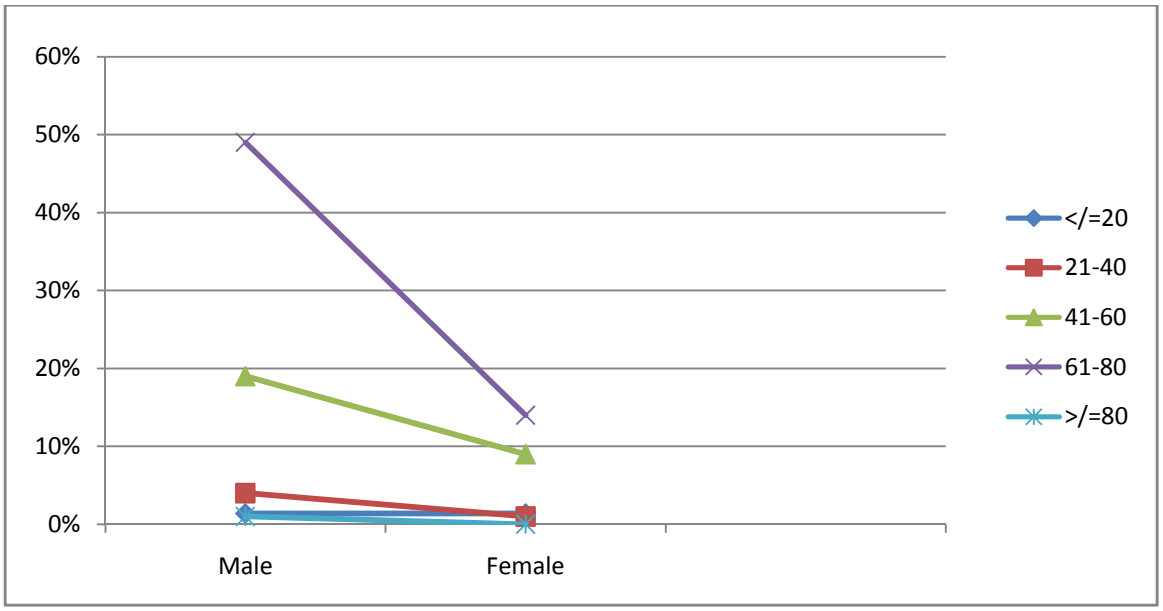

fig 2 : Age distribution in cerebrovascular accident patients

Table 3: Glassgow coma scale in stroke patients on admission

GCS SCORE	PERCENTAGE OF PATIENTS
<8	20%
9-12	13%
13-14	16%
15	51%

Two thirds (68%) of the patients were conscious at presentation. The GCS at presentation were < 8 in 14 cases (20%); 9-12 in 9 patients (13%); 13-14 in 11 cases (16%) and the rest had GCS of 15, 36 cases (51%)

Activity Infarction N (%) Haemorrhage N (%)

In about a third of the cases (19%), stroke occurred on waking up from sleep while 23% occurred while the patients were sitting down. The other activities at onset which were peculiar to intracerebral haemorrhage were driving, while preaching, during an argument, coming back from night vigil, during sexual intercourse and while defecating.

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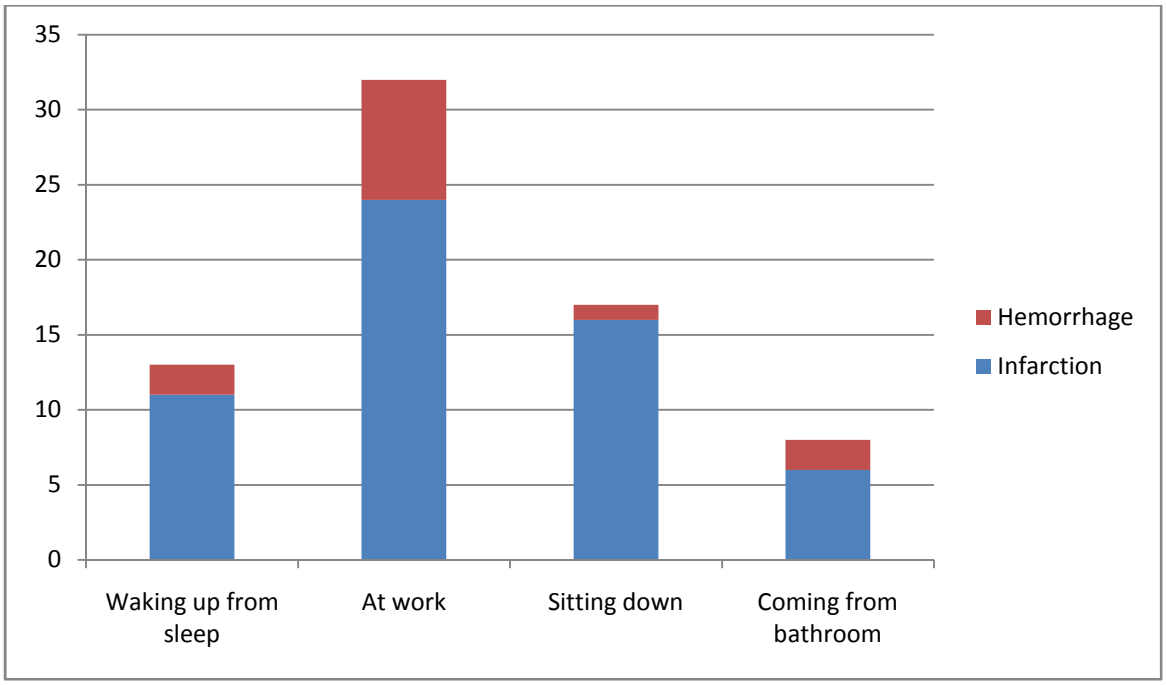


fig 4: Activity at onset of stroke patients

Table 5 : Vascular etiology in Stroke patients.

Ischemic	81% (57)
Hemorrhagic	19%(13)
Ischemic turning to hemorrhagic	3% (2)

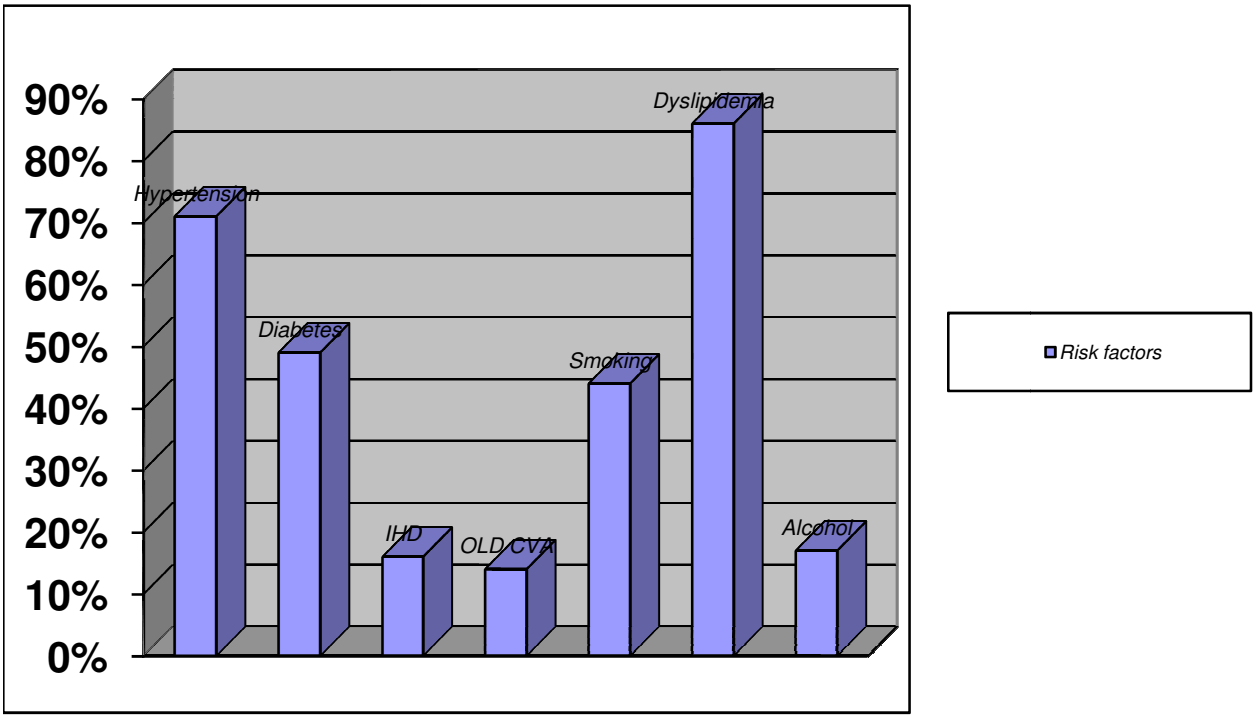
fig 5 : Vascular etiology in Stroke patients

The most common type of stroke by clinical diagnoses was cerebral infarction seen in 57 cases (81%). The other findings were intracerebral haemorrhage (19%) and 2 cases (3%) converted from ischemia to hemorrhage due to anticoagulation.

Table 6 : Risk factors for Stroke

The major predisposing factors noted were dyslipidemia, hypertension, diabetes mellitus, ischemic heart disease (atrial fibrillation) and old cerebrovascular accident accounting for 86%, 71%, 49% , 16% and 14% respectively. The major risk factors were smoking and alcohol accounting for 44% and 17% respectively.

Hypertension	71%(50)
Diabetes	49%(34)
IHD	16%(11)
Old CVA	14%(10)
Smoking	44%(31)
Dyslipidemia	86%(60)
Alcohol	17%(12)



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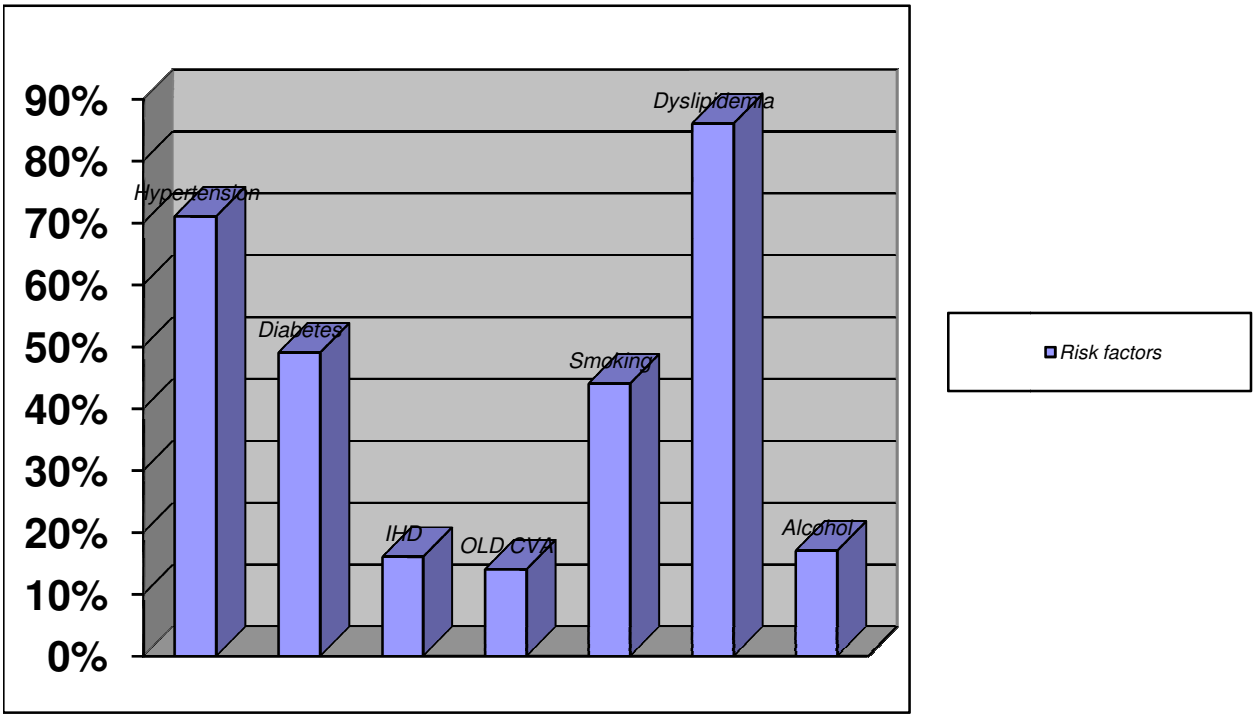

fig 6 : Risk factors for Stroke

Table 7 : HT vs Etiology

			Etiology		Total
			Haemorregic	**Ischemic**	
HT	**No**	Count	6	14	20
		% within HT	30.0%	70.0%	100.0%
	Yes	Count	7	43	50
		% within HT	14.0%	86.0%	100.0%
Total		Count	13	57	70
		% within HT	18.6%	81.4%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.418	1	.120

our study shows no significant difference (p=0.120) between hypertension and the type of stroke (ischemic and haemorregic)

Table 8: HT vs FINALOUTCOME

			FINALOUTCOME					Total
			Expired	**Full**	**Good**	**Minimal**	**Partial**	**Expired**
HT	**No**	Count	1	1	5	1	12	20
		% within HT	5.0%	5.0%	25.0%	5.0%	60.0%	100.0%
	Yes	Count	2	2	10	4	32	50
		% within HT	4.0%	4.0%	20.0%	8.0%	64.0%	100.0%
Total		Count	3	3	15	5	44	70
		% within HT	4.3%	4.3%	21.4%	7.1%	62.9%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.450	4	.978

Chi square test shows a p value of >0.05, so it shows no significant relation between hypertension and the final outcome once stroke has occurred.

Note : for outcome we have consider: Full- full functional recovery, power grade 5

Good – power grade 4

Partial – power grade 3

Minimal – power < grade 3

NPar Tests

Table 9 :Binomial Test

		Category	N	Observed Prop.	Test Prop.	Asymp. Sig. (2-tailed)
HT	Group 1	Yes	50	.71	.50	.000
	Group 2	No	20	.29		
	Total		70	1.00		
DM	Group 1	Yes	34	.49	.50	.905
	Group 2	No	36	.51		
	Total		70	1.00		
Alcohol	Group 1	No	58	.83	.50	.
	Group 2	Yes	12	.17		0.506
	Total		70	1.00		
Smoking	Group 1	Yes	31	.44	.50	.403
	Group 2	No	39	.56		
	Total		70	1.00		

So the above results shows significant correlation between hypertension and occurance of stroke, p=0.000

Table 10 : DM vs FINALOUTCOME

			FINALOUTCOME					Total
			Expired	**Full**	**Good**	**Minimal**	**Partial**	**Expired**
DM	**No**	Count	2	3	8	1	22	36
		% within DM	5.6%	8.3%	22.2%	2.8%	61.1%	100.0%
	Yes	Count	1	0	7	4	22	34
		% within DM	2.9%	.0%	20.6%	11.8%	64.7%	100.0%
Total		Count	3	3	15	5	44	70
		% within DM	4.3%	4.3%	21.4%	7.1%	62.9%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.147	4	.273

P value here is 0.273, so even diabetes has no significant relation between the final outcome once the stroke has occurred.

Table 11 :DM vs Etiology

			Etiology		Total
			Haemorregic	Ischemic	
DM	No	Count	8	28	36
		% within DM	22.2%	77.8%	100.0%
	Yes	Count	5	29	34
		% within DM	14.7%	85.3%	100.0%
Total		Count	13	57	70
		% within DM	18.6%	81.4%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.653	1	.419

P value here is 0.419, so it shows no significant correlation between diabetes and the type of stroke whether ischemic or harmorregic

Table 12 : Means of lipid profile :

Etiology		HDL	CHL	TG
Haemorregic	Mean	38.77	203.15	149.23
	N	13	13	13
	Std. Deviation	8.258	36.141	23.520
Ischemic	Mean	37.04	213.91	156.51
	N	57	57	57
	Std. Deviation	4.000	34.565	23.867
Total	Mean	37.36	211.91	155.16
	N	70	70	70
	Std. Deviation	5.030	34.850	23.804

Table 13: High Density Lipoproteins vs Etiology Crosstabulation

			Etiology		**Total**
			Haemorregic	**Ischemic**	
HDL	**Normal (male>40, female>50)**	Count	5	8	13
		% within Etiology	38.5%	14.0%	18.6%
	Abnormal	Count	8	49	57
		% within Etiology	61.5%	86.0%	81.4%
Total		Count	13	57	70
		% within Etiology	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.177	1	.041

Here the P value is significant < 0.05, so the study shows significant difference between low serum HDL and high incidence of ischemic stroke.

NPar Tests

Table 14 : Binomial Test (HDL)

		Category	N	Observed Prop.	Test Prop.	Asymp. Sig. (2-tailed)
HDL	Group 1	Abnormal	57	.81	.50	.000
	Group 2	Normal	13	.19		
	Total		70	1.00		

Here it shows a strong correlation between low serum HDL and stroke, p=0.00

Table 15 :Cholesterol vs Etiology Crosstabulation

			Etiology		Total
			Haemorregic	Ischemic	
CHL	**Normal (<200)**	Count	4	18	22
		% within Etiology	30.8%	31.6%	31.4%
	Abnormal	Count	9	39	48
		% within Etiology	69.2%	68.4%	68.6%
Total		Count	13	57	70
		% within Etiology	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.003	1	.955

P=0.955, so it showed no significant difference between high serum cholesterol and type of stroke (ischemic or haemorregic)

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Table 16 : Triglycerides vs Etiology Crosstabulation

			Etiology		Total
			Haemorregic	Ischemic	
TG	Normal <150	Count	7	25	32
		% within Etiology	53.8%	43.9%	45.7%
	Abnormal	Count	6	32	38
		% within Etiology	46.2%	56.1%	54.3%
Total		Count	13	57	70
		% within Etiology	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.425	1	.514

Here p=0.514 , so it shows no significant correlation between high triglyceride (>150) and type of stroke.

NPar Tests

Table 17 : Binomial Test (CHL)

		Category	N	Observed Prop.	Test Prop.	Asymp. Sig. (2-tailed)
CHL	Group 1	Abnormal 200 or more	48	.69	.50	.003
	Group 2	Normal <200	22	.31		
	Total		70	1.00		

here it shows a significant difference between high serum cholesterol and occurance of stroke (p=0.003).

NPar Tests

Table 18 :Binomial Test (TG)

		Category	N	Observed Prop.	Test Prop.	Asymp. Sig. (2-tailed)
TG	Group 1	Abnormal	38	.54	.50	.550
	Group 2	Normal	32	.46		
	Total		70	1.00		

.here p=0.550, so there is no significant relation between serum Triglyceride level and stroke.

Table 19 :Smoking vs Etiology

			Etiology		Total
			Haemorregic	Ischemic	
Smoking	**No**	Count	6	33	39
		% within Smoking	15.4%	84.6%	100.0%
	Yes	Count	7	24	31
		% within Smoking	22.6%	77.4%	100.0%
Total		Count	13	57	70
		% within Smoking	18.6%	81.4%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.591	1	.442

here p=0.442, so there is no significant relation between smoking and type of stroke.

Table 20 :Alcohol vs Etiology

			Etiology		Total
			Haemorregic	Ischemic	
Alcohol	**No**	Count	10	48	58
		% within Alcohol	17.2%	82.8%	100.0%
	Yes	Count	3	9	12
		% within Alcohol	25.0%	75.0%	100.0%
Total		Count	13	57	70
		% within Alcohol	18.6%	81.4%	100.0%

Chi-Square Test

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.396	1	.529

here p=0.529, so there is no significant relation between alcoholism and type ofstroke.

Table 21 : Type of Focal neurological deficit in stroke patients

Monoparesis		3% (2)
Faciobrachial		11% (8)
Hemiparesis	**Left**	29% (20)
	Right	50% (35)
Paraparesis		6% (4)
Quadriparesis		0
PCA territory Symptoms		4% (3)

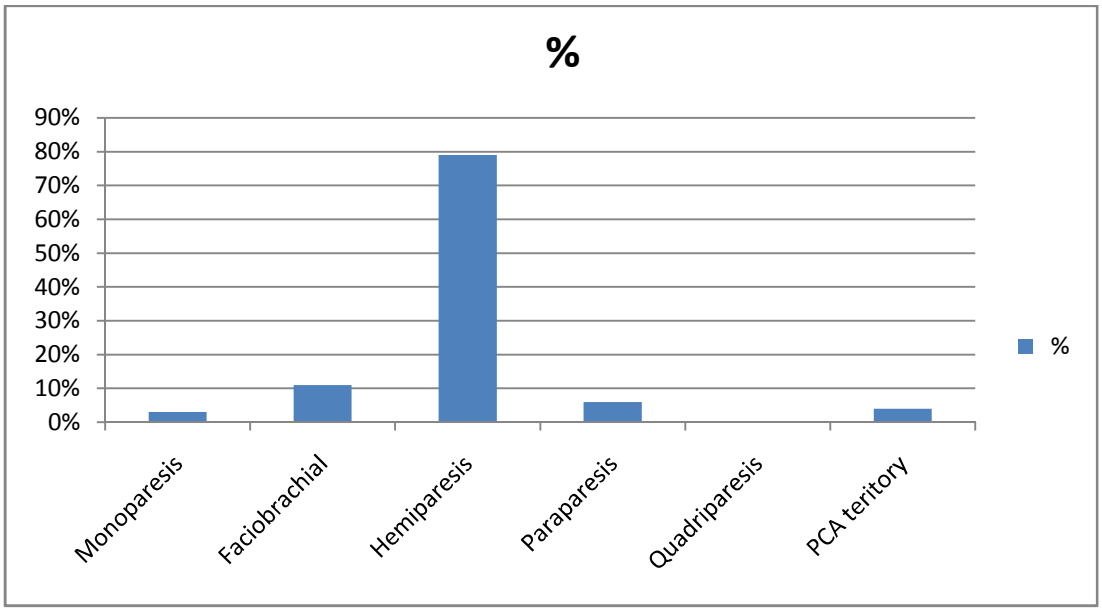

fig 7 : Type of Focal neurological deficit in stroke patients

The majority of the cases were right handed 69 (99%), thus dominant hemisphere involvement presenting with right hemiplegia occurred in 64% of the cases, while left hemiplegia was present in 36%. Faciobrachial weakness was present in 11%(n=8) cases , monoplegia was present in 3% (n=2),while 4 cases (6%) had paraparesis.

Table 22 :Incidence of Aphasias in Stroke:

Aphasia (29/70= 41%)	No of patients	Percentage
Motor	**28**	**96%**
Sensory	**1**	**4%**

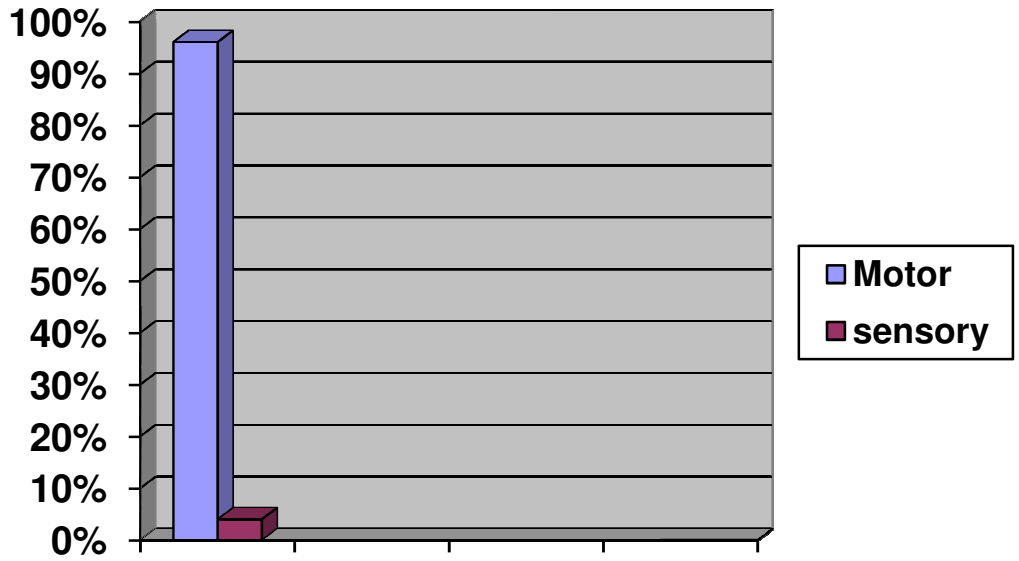

fig 8 :Incidence of Aphasias in Stroke

Aphasia occurred in 41% of cases with majority (96%) of patients having motor aphasia

Table 23: Cranial nerve involvement in Stroke patients.

Cranial nerve	Percentage
VII	74
VII+VI	3
III	3
No cranial nerve involvement	20

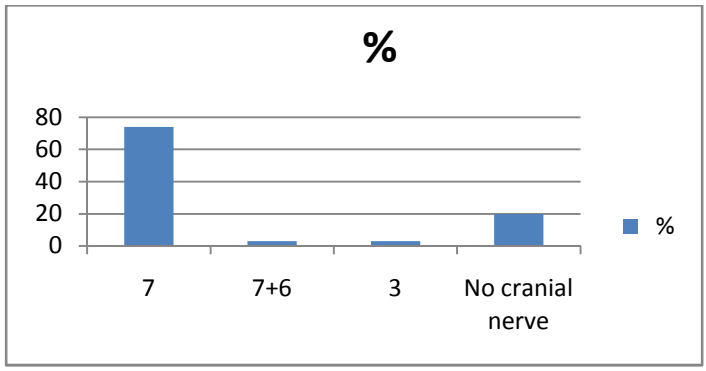

fig 9 : Cranial nerve involvement in Stroke patients

An upper motor neuron involvement of the 7th nerve (n=52, 74%) was the most common cranial nerve involvement. This is followed by combined 7th and 6th nerve involvement in 2 cases (3%) of the cases. The 3rd cranial nerve was involved in 3%(n=2) of the cases. 20%(n=14) of the cases had no cranial nerve involvement..

Frequency Table

Table 24 : vessel involved

		Frequency	Percent	Valid Percent	Cumulative Percent
	MCA	52	74.3	75.4	75.4
	PCA	13	18.6	18.8	94.2
	MCA+PCA	2	2.9	2.9	97.1
	MCA+ACA	1	1.4	1.4	98.6
	MCA+PCA+ACA	1	1.4	1.4	100.0
	Total	69	98.6	100.0	
	Venous sinus thrombosis	1	1.4		
Total		70	100.0		

So the study shows MCA is the most common vessel involved in stroke(75%) followed by PCA (18.6%)

Table 25 : Final outcome in patients with Cerebrovascular accident

Full recovery	4% (3)
Good recovery	21% (15)
Partial recovery	63% (44)
Minimal recovery	7% (5)
Expired	3% (2)

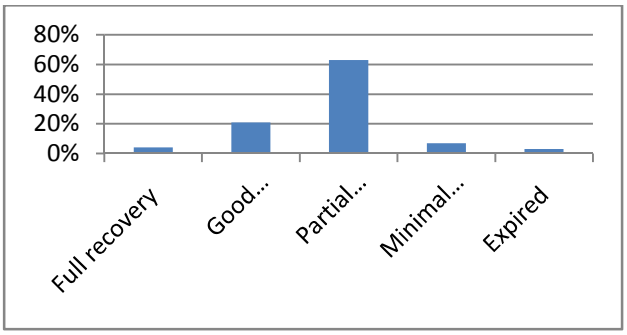

fig 10 : Final outcome in patients with Cerebrovascular accident

In our study 97% of patients survived & 3% expired. Only 3 cases (4%) made full recovery without any neurological deficit. The clinical criteria used was grade 5 power with almost normal speech as full recovery, grade 4-5 power with mild dysarthria as good recocery, power grade 3-4 with mild dysarthria as partial recovery, and power less than grade 3 as minimal recovery.

Table 26 : Final Outcome in stroke patients in different sex

	Male	**Female**	**Total**
Survived	51(98%)	17(94%)	68(97%)
Expired	1(2%)	1(6%)	2(3%)
Total	22	28	70

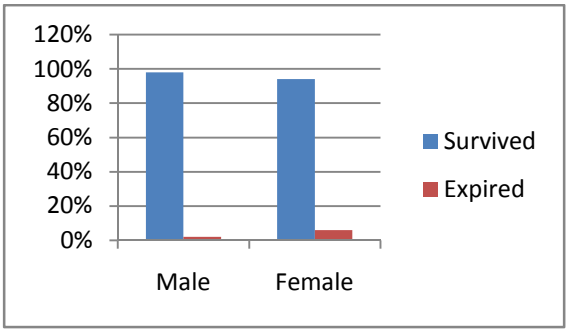

fig 11 : Final Outcome in stroke patients in different sex

No significant difference is observed between male and female population in view of mortality.

Table 27 : Correlation of Age v/s Final Outcome in Cerebrovascular accident patients .

Age{years}	**18-20**	**21-40**	**41-60**	**61-80**	**>80**
Full recovery	1(50%)	1(25%)	1 (5%)	2 (5%)	
Good recovery	1 (50%)	1 (25%)	2(11%)	8 (18%)	1 (100%)
Partial recovery		2 (50%)	15 (79%)	28 (64%)	
Minimal recovery			1 (5%)	4 (10%)	
Expired				2 (5%)	

Good recovery is observed in young age as compared to old age. Maximum mortality rate in our study is found to be in age group > 60 years [attributable to Intracerebral bleed, severity of illness]

Table 28:FINALOUTCOME vs Etiology Crosstabulation

			Etiology		Total
			Haemorregic	Ischemic	
FINALOUTCOME	**Expired**	Count	2	1	3
		% within Etiology	15.4%	1.8%	4.3%
	Full	Count	1	2	3
		% within Etiology	7.7%	3.5%	4.3%
	Good	Count	2	13	15
		% within Etiology	15.4%	22.8%	21.4%
	Minimal	Count	3	2	5
		% within Etiology	23.1%	3.5%	7.1%
	Partial	Count	5	39	44
		% within Etiology	38.5%	68.4%	62.9%
Total		Count	13	57	70
		% within Etiology	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12.480	4	.014

here p=0.014, so there is significant relation between final outcome and type of stroke as here haemorregic stroke has significant mortality rate of 15.4%

Discussion

Stroke is undoubtedly an important disease worldwide and emerging as a public health problem in many nations. In our environment, the incidence of stroke in the community and the country is largely unknown since most studies in the country are hospital based. Even then a trend is seen as the hospital data shows progressive rise in the cases of stroke. Most authors believe that the hospital data is just a tip of the iceberg when compared to what may be seen in the community. Studies to determine the epidemiology of stroke in the community including the rural areas are therefore necessary to plan the prevention of stroke as well as to manage the scarce resources in the treatment of the disease.

In total, 70 patients that fulfilled the criteria were studied. The mean age was 62 years with a peak in the 6th and 7th decades of life (Table 1). This is in keeping with the findings of previous workers where majority of the patients with stroke are in their fifth

and sixth decades of life (3). We also noted a slight male preponderance (M: F = 2.8:1), also supporting findings in other studies and from community based studies. The study by Dr P.M. Dalal in 2006 on burden of Stroke found high prevalence of vascular risk factors and relatively young age of stroke cases in India (3). In an epidemiological study of hemiplegia due to stroke in south India by Dr J Abraham , P.S.S. Rao, S G. Inbaraj ; G. Shetty M.D.; C. J. Jose M.D. findings of a preliminary epidemiological survey of Vellore,South India, found the prevalenceof "completed strokes" and hemiplegias due to any cause is 56.9per 100,000 (11). Even they found the high incidence of hemiplegia in the young (34) as in our study (6/70= 9%) (Table 1).

Many studies showed that the male patient appear to have enhanced risk, especially for thrombotic strokes. The higher prevalence of stroke in males might be due to the higher presence of cardiovascular risk factors in them. Also many of the males are in the upper social class and businessmen, constantly exposed to stress and more likely to adopt a western type diet with consumption of refined, high cholesterol foods in combination with a sedentary lifestyle resulting in increased prevalence of cardiovascular risk factors such as hypertension, diabetes and hyperlipidemia. The study on Stroke in the Urban Population of Calcutta - An Epidemiological Study showed women outnumbered men. They found relatively higher incidence of cerebral hemorrhage compared to western countries, even our study correlates with this finding which showed relatively higher incidence of hemorrhagic stroke (19%). Even study from Parsi community of Mumbai and rural area of Kashmir showed the same thing and our study correlates with these studies (12). Our study like others in the country shows that thrombotic strokes were the most common (81%). All our patients save one were right handed, two-thirds (64%) of them had dominant hemispheric lesion with right hemiparesis or right sided neurodeficit. Many studies have shown that hypertension is a major risk factor for stroke. Hypertension predisposes to various types of strokes especially the hemorrhagic type. Hypertension is a dominant risk factor in our study (71%). All the patients with hemorrhagic stroke and presenting with coma were hypertensive and in more than half of these patients, the hypertension was not well controlled. The fact that some of our patients did not know their blood pressure status and many of those who knew did not have good blood pressure control implies that a lot needs to be done in increasing the awareness of the population on regular blood pressure control and particularly to ensure drug compliance.

Other predisposing factors identified were diabetes mellitus, hyperlipidemia and heart disease (atrial fibrillation). The case fatality of 3% is very low when compared with that from Ibadan and Lagos (13). It is also low when compared with a case fatality of 17% from the Oxfordshire community stroke study in the UK. Our study is hospital based and patients with severe stroke might have died at home or on the way to the hospital. However, when outcome from our own study is compared with that from Oxfordshire, it is poorer as majority of our cases had disabling stroke. In Oxfordshire, the incidence of major disability stroke has reduced over 20yrs because of increased use of preventive treatment such as aspirin, antilipids, antihypertensive and reduction in alcohol consumption and cigarette smoking (10).

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Management in stroke units is ideal and should be goal of every centre involved in the management of stroke patients.

Young adults with stroke deserve an extensive but tailored evaluation,which should include angiography and echocardiography. The causes of ischemic stroke in young adults are numerous.Because treatment options in this group are influenced by apresumed cause, an evaluation on a case-by-case basis is warranted.Our experience suggests that a likely cause will be detectedin most cases and that a regimented battery of tests may notbe required. If strict diagnostic criteria are used, the diagnosisof stroke of undetermined etiology considerably increases. Whilesuch strict criteria are important in clinical trials that testnew interventions, the value of the application of such methodologiesto an unusual population, such as stroke in young adults, needsclarification. In particular, the usefulness of categorizinga stroke as undetermined when two or more possible causes areidentified needs to be explored.

Causes of ischemic stroke in young adults (15-45 years) are diverse, but undetermined etiology is common in a majority of studies. The etiological diagnoses were undetermined, large-artery atherosclerosis, cardioembolism, non-atherosclerotic vasculopathy, and other specific etiologies. The etiological diagnosis of stroke in young adults has changed over time as a result of improvements in diagnostic workup. While cryptogenic stroke was the most frequent diagnosis in the past, today specific causes (non-atherosclerotic vasculopathy, large-artery atherosclerosis, cardioembolism and hematological disorder) are identified in the majority of patients.

In conclusion, stroke is still a major problem in our environment and the major risk factor remains uncontrolled hypertension. The case fatality decreased significantly with a risk of moderate to severe neurological disability among the survivors. We recommend that community based intervention measures such as health education of the community with emphasis on control of the predisposing factors, and education of general practitioners who are usually the first to handle stroke patients be put in place to address the burden of the problem and the inadequate control of blood pressure among hypertensive patients. The primary health workers should also be educated and trained to pass across information to the people at every available opportunity the advantages of exercise, maintaining a healthy weight, avoid or quit smoking and monitoring of blood pressure and glucose levels regularly. There is also the need for public enlightenment campaigns to educate the population about the need to check their blood pressures regularly and if hypertensive to comply with their medications. Efforts to make radiological imaging test available and affordable should be pursued both by the government and public institutions as well as by nongovernmental organizations.

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