

Patient Profile of 200 Cases of Stroke: A Hospital Based Study

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SUMMARY

Stroke or "Brain attack" results either due to sudden occlusion or rupture of a cerebral blood vessel. It is the second most common cause of death world wide. The presentation of stroke may vary from transient ischaemic attack (TIA) with full recovery to complete stroke leading to life long disability. Two hundred patients with stroke of both sexes and age above 18 years of age were studied in regards of mode of presentation, laboratory investigations, associated risk factors and ultimate outcome was evaluated. Males outnumbered females and majority of cases were in the age group of 41-80 years. Other parameters are detailed in the study. Hypertension was the most significant risk factor ($p=.018$). Left parietal area was more commonly involved than the right ($p=.003$) and so was the significant involvement of the left middle cerebral artery ($p=.002$). Overall outcome was poor in patients with more than one risk factors. Majority had medical treatment. The incidence of haemorrhage was 25-30% which is more than western studies due to poor control of hypertension in our community where as cerebral infarction was about 60-70%. Around 3% had subarachnoid haemorrhage. It is therefore concluded that control of risk factors especially the modifiable eg hypertension, diabetes mellitus and hypercholesterolaemia can reduce mortality from stroke significantly. It is also suggested to create stroke units with expertise and proper guidelines for management of stroke should be formulated to prevent a great deal of morbidity and mortality from this preventable disease.

INTRODUCTION

A stroke or "brain attack" results due to sudden interruption of blood supply to a part of the brain in the form of sudden occlusion or rupture of a blood vessel thus resulting in hypoxaemia which in turn causes brain cell damage, as the brain is most vulnerable to low oxygen levels as compared to other organs.

Hippocrates, the father of Medicine, recognized and described stroke as sudden onset of paralysis 2400 years ago. The stroke was also called apoplexy *i.e* any one suddenly struck down with paralysis. Johann Jacob Wepfer, from Switzerland in 1620 investigated the signs of "apoplexy". Until recently, modern medicine has had very little to empower over this ailment but new and better therapies are being developed every day.

The stroke is the second most common cause of death worldwide and third leading killer in the

USA. It is stated to be the most common cause of disability world wide¹.

The impact of stroke is variable on the individual, families and ultimately the communities. About 500,000 Americans in the USA have stroke each year and approximately 145,000 die from it and its complications and 4 million remain disabled out of total population of 250 millions².

World Health Organisation data reveal that 4.5 million people die each year due to stroke. Even though stroke is the most common cause of adult disability in the UK (prevalence of 5-8 per 1,000 in people over the age of 25) and accounts for £500 million (12%) of the National Health Services and still it is felt that there are inadequacies in the planning and delivery of stroke services to such a developed nation.

There are a number of risk factors which make one more prone to develop this illness. Some are modifiable and others are non-modifiable and there

have been different degrees of impact from these factors in the course of the disease³.

Broadly speaking, stroke can be divided into ischaemic and haemorrhagic varieties. The incidence is approximately 80% and 20% respectively. There are different warning signs of a stroke. There can be either sudden numbness or weakness of face, arm or leg on one side of the body or sudden confusion and difficulty in speech, vision or headache and even loss of consciousness.

Stroke occurs in all age groups, both sexes and all races in every country of the world. It can even occur in-utero. However, some minority groups are more prone to develop stroke than the rest of the population.

According to WHO at least 10 million new cases of stroke occur every year in the world. The incidence rate for stroke varies from 285 per 100,000 (Finland males) population to 47 per 100,000 (German females)⁴. In the USA, there is a general decline in the incidence of stroke in the last 30 years due to better knowledge and prevention strategies of the modifiable risk factors^{5,6}.

The National Institute of Neurological Disorders and Stroke (NINDS) in the USA is doing enormous research and the most exciting development in this field is the approval of drug treatments which can reverse the course of stroke if given during the first few hours of the onset of symptoms⁷.

As regards economical impact, the total cost of stroke in the USA is estimated at about 43 billion US dollars per year and the average cost of care for a patient up to 90 days after stroke is approximately 15000 US dollars which can go up to more than 35000 US dollars in 10% of the cases⁸.

OBJECTIVES

Keeping all the above mentioned facts in mind, a study was performed in the Department of Medicine at Shaikh Zayed Hospital, Lahore from February 1998 to September 2000 to highlight different aspects of stroke.

PATIENTS AND METHODS

All patients with stroke above 18 years of age, irrespective of sex, geographic origin or ethnic background were included in this study.

Different causes leading to stroke were studied

including infarction, intracerebral bleed, subarachnoid haemorrhage and space occupying lesions.

Different risk factors including hypertension, diabetes mellitus, hypercholesterolaemia, along with previous strokes including TIA's were studied.

Complete neurological examination was performed including level of consciousness with Glasgow Coma Scale but few aspects of neurological examinations were limited due to lack of co-operation on the part of patient which in turn was due to neurological disabilities *i.e* aphasia both expressive and receptive, coma and immobility.

Investigations included complete blood count, ESR, clotting profile, blood sugar and cholesterol. Auto antibody profile, echocardiography, chest X-ray and ECG were also included. Examination of CSF was optional. Computerized Tomography (CT) was mandatory in almost all cases. The clinical diagnosis was compared with CT scan findings and analyzed accordingly.

These patients were managed medically most of the time and very few had surgical intervention. Total stay in the hospital and mortality and morbidity was also analyzed.

RESULTS

Out of 200 patients included, there were 106 (53%) males and 94 (47%) females. Male to female ratio was 1.2:1.

The overall mean age of the patients was 60.5 ± 12.8 ranging from 20 to 99 years. Only one patient was 100 years old. The mean age for male was 61.9 ± 13.4 and mean age for females was 59.9 ± 12.5 . The maximum numbers were for males in the age group 61-80 years [49 patients (24%)] and for females it was in age group 41-60 years [45 patients (23%)]. However the total number was equal *i.e* 88 (44%) of males and females in the age group 41-60 and 61-80 respectively as shown in Table 1.

There was no significant difference among the ages of different sexes. However most of the strokes occurred between ages 41-80 years (86.5%).

Majority of the patients were coming from different areas of Lahore 151 (76%), Sheikhpura 13 (6.5%), Gujranwala 11 (6%) and Okara 5 (2.5%). The rest of 20 (10%) patients attended accident and emergency department from other than these areas.

Most of the patients of stroke were admitted during summer rather in winter which is in contrast to occurrence of myocardial infarction. This might be an incidental finding and the author does not implicate it to be absolutely true.

Table 1: Demographic features of study population (n=200)

<i>Sex</i>	<i>Number</i>	<i>Percent</i>	
Males	106	53	
Females	94	47	
<hr/>			
<i>Age (years)</i>	<i>Mean \pm S.D</i>		
Males	61.9 \pm 13.4		
Females	59.9 \pm 12.5		
Total sample	60.5 \pm 12.8		
<hr/>			
<i>Age distribution</i>	<i>Males</i>	<i>Females</i>	<i>Total</i>
20-40 years	9	8	17
41-60 years	43	45	88
61-80 years	49	36	85
> 80 years	5	5	10

The duration of symptoms varied from hours to few days. Majority of patients with stroke presented to accident and emergency department during first 24 hours (out of these majority presented between 1-8 hours) *i.e.* 129 (64%), and 64 (32%) presented during 1-7 days (majority between 1-3 days). Only 6 (8%) had presented after a duration of more than one week and 1 (0.5%) had an SOL for a duration of more than 2 months.

As regards different clinical presentations, interesting facts were revealed. This is shown in Table 2.

Majority 104 (52%) presented with headache whereas 94 (48%) had no headache. Out of those with headache 47 (23%) had left sided headache with right hemiplegia and 35 (17%) had right sided headache with left hemiplegia. 24 patients (14%) had occipital headache.

Table 2: Clinical Features

	Number	Percent
SYMPTOMS		
Mode of onset		
Sudden	165	83
Gradual	35	17
Vomiting		
Present	111	55.5
Absent	89	44.5
Site of headache		
Left	47	23
Right	35	17
Occipital	24	14
No headache	94	48
Convulsions		
Focal	21	10.5
Generalized	17	8.5
No convulsions	162	21
SIGNS		
Conscious Level		
Normal	88	44
Semi conscious	62	31
Comatosed	50	25
Side of weakness		
Left	84	42
Males	58	64.6
Females	26	35.4
Right	97	49
Males	41	39.6
Females	56	58.4
Both sides	16	8
Males	10	62.5
Females	6	37.5
None	3	1.5
Type of respiration		
Normal	142	72
Laboured	45	22.5
Cheyne-Stokes	13	6.5
GCS Scoring		
3-6	48	24
7-10	42	20
11-15	110	55
Conjugate Eye Movements		
Normal	94	47

(Continued)

Table 2: (Continued)

	Number	Percent
Deviated to right	27	14
Deviated to left	49	45
Could not be elicited	30	15
Fundus		
Hypertension	52	26
Diabetes	22	11
Diabetes & Hypertension	15	8
Papilledema	10	5
Optic nerve atrophy	2	1
Normal fundus	81	40
Could not be examined	18	9

Nausea or vomiting was present at the time of stroke in 111 (56%) of the patients and absent in 89 (44%) of the patients. Majority of patients 88 (44%) were fully conscious at the time of presentation. Sixty two (31%) patients were semiconscious and 50 (25%) were comatosed, which was a significant finding.

As regards convulsions or fits, majority of patients 162 (81%) had none whereas 21 (10.5%) had focal and 17 (8.5%) had generalized convulsions.

Emotional lability was in the form of crying out bursts, agitation, and depressive attitude.

It was also observed that 4 (2%) patients recovered spontaneously within 24 hours after admission and they all came within 1-8 hours after the episode, whereas 196 (98%) did not recover completely. Those 4 cases recovered completely were those of TIA's.

Majority of patients had right sided weakness 97(49%) and 84 (42%) had left sided weakness. In 16 (8%) both sided weakness was noticed. In 3 (1.5%) no significant weakness was appreciated.

Table 3 shows prevalence of hypertension, diabetes mellitus ischaemic heart disease individually and then in various combinations. Hypertension as a solo risk was the most prevalent i.e 68 (34%) and male to female ratio was almost similar. Out of the rest of the 6 (3.5%) patients, 4 (2.5%) had meningitis, 1 (0.5%) had valvular heart disease and 1 (0.5%) mixed connective tissue disease.

Table 3: Predisposing diseases (Risk factors)

Condition	Number	Percent
HTN	68	34
IHD	07	1.5
DM	30	11
HTN + IHD	27	10
HTN + DM	43	21.5
HTN + DM + IHD	19	8.0

Rest had either none of the above, or meningitis, valvular heart disease etc. but their number was very small.

As already mentioned, hypertension was the most prevalent risk factor and 155 (75%) had a blood pressure of more than 140/90 and 45 (22.5%) patients had BP less than 140/90 mm of Hg. 81(40.5%) patients had a diastolic blood pressure ranging from 90-110 mm of Hg, therefore hypertension, both systolic and diastolic has a significant contribution to stroke as supported by other studies.

Table 4 shows distribution of hypertension in relation to male and female prevalence in the study ($P=.018$).

An other observation was presence of carotid bruits and peripheral pulses status. In all patients 200 (100%) peripheral pulses were present and in 19 (10%) carotid bruit was present whereas in 181 (90%) it was absent. Carotid bruit does indicate atherosclerotic narrowing but it is only significant if the narrowing is more than 70%.

As far as signs of meningeal irritation were concerned, it was present in 18 (9%) and absent in 182 (91%). The signs were present either due to meningitis, or subarachnoid haemorrhage or intra cerebral bleed with leakage in the inter-ventricular system.

Laboratory parameters in relation to gender with mean and standard deviation is shown in Table 5.

Table 6 shows haematological investigations in relation to the results and control. Majority of patients 168 (84%) had a haemoglobin between 10-16 g/dl. No patient had a haemoglobin of more than 19 gm/dl. Majority 90 (45%) had an ESR ranging between 1-20 mm in 1st hour. 107 (53.5%) patients had raised TLC either due to stress or infections.

especially chest or urinary tract infection. Platelets were adequate in most patients. Only 16 (8%) had prothrombine time (PT) of more than 15 seconds probably due to underlying liver disease.

Table 4: Hypertension * Sex Crosstabulation

		Female	Male	Total
Hypertension	Absent	14 (31.1%)	31 (68.9%)	45 (100%)
	Present	80 (51.6%)	75 (48.4%)	155 (100%)
Total		94 (47%)	106 (53%)	200 (100%)

Table 5: Laboratory Parameters

Sex	N	Mean \pm SD	SEM
Haemoglobin			
Female	94	12.9 \pm 2.3	0.2
Male	106	13.5 \pm 2.1	0.2
ESR			
Female	94	34.9 \pm 22.7	2.3
Male	106	27.2 \pm 20.3	1.2
White Cell Count			
Female	94	10.9 \pm 3.2	0.3
Male	106	12.1 \pm 6.5	0.6
Platelets			
Female	94	261669.1 \pm 113853.9	11743.1
Male	106	242665.1 \pm 94556.3	9184.1
PT			
Female	94	14.0 \pm 5.1	0.5
Male	106	13.5 \pm 2.6	0.3
APTT			
Female	94	37.8 \pm 11.1	1.1
Male	106	35.9 \pm 6.2	0.6
Blood Sugar Level			
Female	94	179.1 \pm 85.8	8.8
Male	106	163.0 \pm 65.9	6.4
Serum Cholesterol			
Female	94	214.9 \pm 51.0	5.3
Male	106	214.8 \pm 44.3	4.3

Table 6: Haematological investigations (n=200)

Hb g/dl	8-10	10.1-13	13.1-16	16.1-19	>19
No. of Patients	18	77	91	14	None
Control = 12g/dl	(9%)	(39%)	(45%)	(7%)	
ESR mm in 1st hour					
Control = 0-20	01-20	21-40	41-60	61-80	81-100
No. of Patients	90	72	21	9	8
	(44%)	(34%)	(11%)	(4.5%)	(4%)
WBC $\times 10^9$ /dl					
Control = 4-10,000	<4.0	4.1-10	10.1-20	20.1-30	30.1-40
No. of Patients	2	87	107	4	None
	(1%)	(44%)	(53%)	(2%)	
Platelets per mm ³					
Control = 150,000-350,000	150000	150000-250000	250000-350000	350000-450000	>450000
No. of Patients	19	83	73	22	3
	(10%)	(41%)	(37%)	(11%)	(1.5%)
Prothrombin time (PT) Sec					
Control = 12 Sec	12	13	14	15	>15 < 20
No. of Patients	57	59	41	27	16
	(28%)	(30%)	(20%)	(14%)	(8%)
Activated Partial Thromboplastin Time (APTT) Sec					
Control = 35 Sec	25-30	31-35	36-40	41-45	>45
No. of Patients	45	59	63	22	11
	(21%)	(30%)	(31%)	(11%)	(6%)

Eighty three (41%) patients had blood sugar ranged from 120-180 mg/dl and only 32 (16%) of patients had a blood sugar between 181-240 mg/dl. Cholesterol levels were 150-200 mg/dl in 88 (44%) and 200-300 mg/dl in 110 (55%) patients as shown in Table 7.

Chest X-ray was normal in 134 (66%) and significant cardiomegaly was noted in 54 (27%) cases.

ECG analysis showed that 61 (35.5%) had evidence of LVH with strain pattern, 51 (26%) showed ischaemic changes, 9 (4.5%) revealed dysrhythmia i.e. atrial fibrillation, heart block of

variable degree and VPB's. Normal ECG was noted in 79 (40%) of patients. On echocardiography, hypertensive changes were seen in 61 (31%), myocardial infarction in 34 (17%) and normal ECHO in 66 (33%) of the patients. In 39 (20%) of the patients, echocardiography was not performed. Lumbar puncture was performed in 8 (4%) to rule out meningitis in 5 (2.5%) (pyogenic and tuberculous) after ruling out papilloedema by fundoscopic examination, and sub-arachnoid haemorrhage in 3 (1.5%).

Table 7: Blood sugar and cholesterol

	Number	Percent
Blood Sugar Level (mg/dl)		
60-120	54	27
121-180	83	41
181-240	32	16
241-300	16	8.5
301-400	13	6.5
>401	2	1
Cholesterol (mg/dl)		
150-200	88	44
201-250	60	30
251-300	50	25
301-350	2	1
351-400	-	-
>400	-	-

Computerized tomographic (CT) findings are explained in Table 8. Haemorrhage was seen in 52 (25%), infarction in 136 (66.5%), sub-arachnoid haemorrhage in 3 (2.5%), SOL in 1(0.5%) and no findings in 2 (1%). In two case it was hydrocephalus and in 4 patients CT could not be performed due to non affordability on the part of the patient. Sex distribution revealed interesting facts. It showed that amongst total of 136 cases of cerebral infarction, males were 78 (57.3%) and females were 58 (42.7%) and amongst 52 cases of intracerebral haemorrhage males were 28 (53.8%) and females were 24 (46.2%). These figures indicate that there was no significant sex difference in the occurrence of these two major events. Another interesting feature was that about 18 (9%) of the patients suffered more than one stroke in the previous 5

years.

Table 9 shows that majority of areas involved on CT scan was parietal in both subtypes of stroke and left parietal area was involved more than the right as previously mentioned ($P = .003$).

Table 8: CT Scan Findings

Findings	Number	Percent
Cerebral infarction	136	66.5
Cerebral haemorrhage	52	26.0
Sub-arachnoid haemorrhage	3	2.5
Space occupying lesion	1	0.5
Hydrocephalus	2	1.0
Normal	2	1.0
CT scan not done	4	2.0

Table 9: Parietal Area on C.T. * Sex Crosstabulation

		Female	Male
Total			
Parietal Area on C.T.			
Normal	37 (50%)	37 (50%)	74 (100%)
Right	18 (32.1%)	38 (67.9%)	56 (100%)
Left	39 (60%)	26 (40%)	65 (100%)
Right & Left		5 (100.0%)	5 (100%)
Total	94 (47%)	106 (53%)	200 (100%)

It was also noted that the territory of left middle cerebral artery was more involved than the right in both these subtypes in relation to sex distribution. It is shown in the Table 10 ($P = .002$).

All the patients were admitted and were given therapeutic and supportive therapy according to their condition at the time of admission and

thereafter during hospital stay in particular relation to the risk factors and only a couple of patients opted for surgical intervention in the form of evacuation of intracerebral haematoma or debulking of SOL.

Table 10: Middle Cerebral Artery * Sex Cross tabulation

	Female	Male	Total
Middle Cerebral Artery			
Normal	18 (47.4%)	20 (52.6%)	38 (100%)
Right	27 (35.5%)	49 (64.5%)	76 (100%)
Left	48 (61.5%)	30 (38.5%)	78 (100%)
Right & Left	1 (12.5%)	7 (87.5%)	8 (100%)
Total	94 (47%)	106 (53%)	200 (100%)

Majority of patients 97 (48%) stayed in the hospital between 5-10 days, 46 (24%) stayed between 11-16 days. Out of 6 patients 4 stayed between 20-30 days. Two patients stayed between 30-40 days and one patient for 60 days. Overall stay was 11.5 ± 2.5 days. Median stay was 10 days and ranged between 1-60 days. Males had 8.6 ± 5.3 days and females had 9.8 ± 7.6 days of stay respectively.

Table 11 shows different aspects of survival analysis. 154 (76%) patients were discharged and 46 (24%) died. Out of discharged patients 4 left against medical advice. Out of 136 patients with infarction, 22 (16.2%) died whereas out of 52 patients with haemorrhage 20 (38.4%) patients died. Two cases (66.6%) out of 3 subarachnoid haemorrhage also died indicating high mortality especially in the elderly population. Amongst these 46 patients who died, most of the deaths were due to uncontrolled hypertension, bad glycaemic control, massive cerebral infarction (involving whole territory of middle cerebral artery), massive haemorrhage, age more than 60 years and degree of level of consciousness (Glasgow coma score <5) along with other complications including nosocomial infections and pneumonias.

Table 11: Survival Analysis.

	Number	Percent
Died	46	23
Discharged	150	75
Left against medical advice	4	2
Survival by scan findings	Alive	Dead
Cerebral infarction	114 (83.8%)	22 (16.2%)
Cerebral haemorrhage	32 (61.6%)	20 (38.4%)
Subarachnoid haemorrhage	1 (33.4%)	2 (66.6%)
Hydrocephalus	2 (100)	0
Space occupying lesion	0	1 (100%)
CT scan not done	1 (50%)	1 (50%)
Mortality analysis and different risk factors		
Hypertension	16	34.7%
Diabetes Mellitus	5	10.5%
Previous stroke	2	4.3%
Hypertension and Diabetes	7	15.2%
Ischemic heart disease and Hypertension	5	10.8%
Diabetes mellitus, hypertension and hemodialysis	11	23.9%

Increasing the number of risk factors also increased mortality as compared to single risk factors.

DISCUSSION

Stroke is not only the second leading cause of death world wide but also leaves the surviving patient with mild to severe disability thus increasing morbidity as well. It has been shown that more than 50% of stroke patients, who survive are left with severe and permanent disability⁹.

Stroke was common in males than females which is a known fact¹⁰. However, few studies show the reverse in true¹¹.

The mean age in this study profile was (60.5 ± 12.8) years which is lower as compared to Western studies where the average life expectancy is very high¹¹. Similarly the number of patients were maximum in age group 41-80 years whereas, less were present in age group 20-40 and above 80 years of age. Only one case was 100 years of age.

The outcome depends on the age group too.

Strokes are better managed in acute stage and thereafter in large hospitals with facilities of ventilation and intensive care as compared to peripheral hospitals without these facilities¹².

Seasonal variation is not true for stroke as compared to myocardial infarction which is more common in winters. Sudden onset of the event was common and so is the name - stroke. It was sudden in 83% where as in 17% it was slow in onset. Most of the hemorrhagic¹³ and embolic episodes¹⁴ occur suddenly, where as thrombotic¹⁵ process takes a long time, therefore presentation is gradual.

Most of the of strokes occur within hour or two and in some cases the presentation is wax and waning due to process of thrombogenesis in cerebral vessels. However symptoms of numbness and weakness are most alarming to the patient which force him to seek medical attention urgently¹⁶.

Headache was the commonest symptom at presentation. Patients with hemorrhagic stroke had severe headache all around and patients with sub-arachnoid haemorrhage had typical occipital headache¹⁷.

Majority (81%) of patients had no seizures at presentation. Whereas only 10% had focal and 8.5% had generalized seizures¹⁸. Other studies also showed same results¹⁹.

Nausea and vomiting is again a common feature at presentation. Nausea is more common. This is either due to irritation of vomiting center or associated with vasovagal phenomenon or increased intra cranial pressure. Classical projectile vomiting is seen in patients with space occupying lesion e.g. tumour, granuloma or abscess²⁰.

Only 4 patients (2%) recovered within 24 hours without any residual neurological deficit (TIA). Whereas majority were left with more or less disability in the form of weakness or dysphasia or aphasia. Two of them already had TIA's in the past and this time it was made sure that they get anti-platelet therapy or long term anti-coagulation²¹. TIA precedes a stroke in 10-14% of cases and independent relative risk of stroke after TIA is 3.9. Thirty-days recurrence rate rises from 2.2% for lacunar to 7.9% for large infarcts. There is a 35% probability of recurrence of stroke within 5 years.

Highly significant differences were found between males and females in terms of side of weakness. Over all, almost equal number of patients

had paraesis / paralysis of left or right side of body, 49.5% on left and 50.5% on the right side. Of the 99 patients with left sided weakness, 35.4% were females and 64.6% were males. 101 patients had right sided weakness. 58.4% of these were females and 41.6% were male. Thus males predominantly had left sided weakness while females had predominantly right sided weakness. It was also observed by other studies²².

Out of a total sample of 200 patients, 45 (22.5%) were normo-tensives and 155 (77.5%) were hyper-tensive either as a solo entity or in combination with diabetes and ischaemic heart disease. 31.1% of normo-tensive patients were females while 68.9% were males. 51.6% of the hyper-tensive patients were females while 48.4% were males. The female preponderance was seen in the analyzed data with reference to presence of hypertension. This is most common risk factor and has been suggested by many other studies^{11,23}. Framingham study has demonstrated that effective management of hypertension reduced risk of stroke by at least 10%. Incidence of stroke is 4-6 times higher in hyper-tensive patients than normo-tensive. 40-90% of stroke patients have hypertension prior to the event. At about 90 years of age without hypertension, absolute risk of stroke is same as with hypertension and that is due to advanced atherosclerosis. Antihypertensive drugs can reduce stroke incidence up to 35% and fatality up to 40%²⁴. A meta analysis of 18 long term randomized trials found that both beta blockers and high dose diuretic therapy were effective in preventing stroke²⁵.

Mortality in patients with hypertension was 38% where as according to an other study²⁶ it ranged from 34.3% to 55.5% mortality depending upon type of stroke *i.e* haemorrhagic strokes do worse than ischaemic strokes generally.

Hypertension when present in combination with diabetes and ischaemic heart disease also increased mortality and prolonged the hospital stay of the patients. Cardiac diseases are important stroke risk factor as well, and data shows that cardio embolic event accounts for 14-20% of all ischaemic strokes. These events are associated with larger infarcts due to large sized thrombus or embolus and due to the abrupt occlusion of the vital cerebral artery. In Framingham study, it was shown that 8% of men and 11% of women will have a stroke within 6 years after acute myocardial

infarction and that myocardial infarction is also associated with atrial fibrillation²⁷.

In Stroke Prevention in Atrial Fibrillation (SPAF) trial, warfarin was more effective than aspirin²⁸. Systemic embolism was reported to occur in 9%-14% of patients with mitral stenosis.

If carotid bruit is present then there is increased risk to subsequent strokes but not specifically in distribution of the artery with the bruit. This is same as in another study³⁰ where all patients had infarctions. In one of the studies carotid stenosis (significant > 50%) were detected in 7% of the men and 5% of the women of age > 65 years. In the current study, however no statistically significant difference was noted. Laboured breathing and lower scoring in GCS were both bad prognostic factors as shown in the results, indicating deep coma due to considerable ischaemic brain damage.

Fundoscopy examination was found to be very important and both hypertensive and diabetic changes were found in majority of patients indicating long term uncontrolled hypertension and diabetes. Papilloedema indicated either severe hypertension (accelerated) or raised intracranial pressure.

Analysis of different investigations revealed statistically significant difference between males and females in reference to ESR and haemoglobin levels. Females had higher mean values for ESR (34 mm in 1st hour) and males had higher mean values for haemoglobin (13.5 g/dl). Perhaps higher haemoglobin leads to hyperviscosity and higher ESR indicate hypergammaglobulinaemia again causing hyperviscosity due to increased rouleaux formation and clumping of red blood cells.

In this study Diabetes (both Type-1 and Type 2, the later more common than the former) was present in 83 (41%) and absent in 117 cases (58%). Another study¹⁶ also confirms it. Another study in this context showed an incidence of 20.3%³¹. Diabetes notoriously increases the risk of thromboembolism leading to stroke as compared to without diabetes³². In diabetics the risk of stroke is 3 times more than normal population and relative risk is maximum in 5th-6th decades. It is higher in men at earlier age than women. It is well known that one, two and three years after completed stroke, the cumulative risk of subsequent stroke is 10% to 18%, 16% to 26% and 20% to 34% respectively.

In Framingham study, patients with glucose intolerance had 2 folds the risk of brain infarction as compared to non-diabetic patients³³. Hypertension is also common in type 2 diabetes with a 40-60% prevalence. In this study 43 (21.5%) patients had hypertension and diabetes but just failed to achieve statistical significance as regard to sex distribution (48.9% female versus 34.9% diabetic males).

The Paris prospective study³⁴ and others show that there is a higher risk of mortality in stroke with diabetes^{33,34}.

Although, lipid abnormalities are considered as risk factor for coronary artery disease, there was however no statistically significant difference in two sex groups. Various studies have shown that stroke risk is reduced after treatment with 'statins'³⁵. Ideal cholesterol should be lower than 200 mg/dl, LDL lower than 130 mg/dl and if it is more than 160mg/dl it puts the patient at higher risk. HDL should be more than 35mg/dl and an HDL of less than 35mg/dl but with high LDL puts the patient even at higher risk of developing stroke. High cholesterol increases ischaemic stroke and prevents haemorrhagic stroke, as the atherosclerosis of cerebral blood vessels make them resistant to burst thus reducing the chance of haemorrhage but promotes thrombogenesis due to atherosclerotic plaque formation.

On CT scanning, 74 (37.0%) patient had normal parietal cortex, 56 (28.0%) had a right sided lesion, 65 (32.5%) had left sided lesion and in 5 (2.5%) bilateral parietal lesions were found. 18 (32.1%) patients with right sided parietal cortical lesions were females while 38 (67.9%) were males. 39 (60%) patients with left sided parietal lesions were females while the remaining 26 (40%) were males. All patients with bilateral parietal lesions were males. Thus females had a higher number of left parietal lesions as compared to males and difference was statistically significant ($P=0.003$).

This difference cannot be explained, although left cerebral hemisphere is predominant one and also has more blood supply than right hemisphere, and perhaps early atherogenesis in males may explain more incidence on the right side³⁶. Other areas including frontal, temporal and occipital were not statistically significant. As regards anatomical correlation, distribution of lesions in the region of middle cerebral artery (MCA) had a statistically significant difference between both sexes

($P=0.002$). 38 (19%) patients had normal middle cerebral arteries, 76 patients (38%) had right middle cerebral artery MCA lesion, 78 patients (39%) had left MCA lesion and 8 (4%) had bilateral MCA lesions. Out of the 76 patients with the right MCA, 35.5% were females while 65.5% were males. This pattern was reversed on the left side with 61.5% females and 38.5% males having a left sided MCA lesion. 12.5% of patients with bilateral lesions of MCA were females while males constituted 87.5% of this sub-group. Thus females had predominantly left sided MCA lesions. This explanation, again is the same as already mentioned.

Other territories *i.e.* anterior cerebral artery (ACA), posterior cerebral artery (PCA) and posterior inferior cerebellar artery (PICA) were not statistically significant as the number were too small. The duration of hospital stay was also not statistically significant.

There were 136 cases of infarction and 55 of intra cerebral haemorrhage including 3 cases of subarachnoid haemorrhage. The cerebral infarction (CI) intracerebral haemorrhage (ICH) ratio is lower in Asians as compared to Western countries due to increased incidence of intra cerebral haemorrhage which in turn is due to poor control of hypertension. In one study 36 it was 2.96 and in this study it was 2.4. In most of Western studies it is more than 5.0²⁸.

As far as management of stroke is concerned, mostly anti platelet therapies available were used *i.e.* Disprin/Aspirin³⁷ preparations both simple and enteric coated and Ticlopidine (Ticlid or Teolid) were used for ischaemic stroke 50. Clopidogrel (Plavix) is new drug with different mechanism of action and is used in quite a few centers in Pakistan but mostly by the cardiologists and cardiothoracic surgeons. Whereas patients with evidence of atrial fibrillation leading to embolic strokes, long term warfarin³⁸ was used after ruling out any contra indications and a close eye was kept on their anti coagulation profile. Dipyridamole (Persantin) as single or in combination with aspirin is also being used in managing and preventing ischaemic strokes in some centres around the world³⁹.

In sub-arachnoid haemorrhage, one uses Nimodipine (Nimotop) 60 mg 4 hourly for 21 days. For intracerebral haemorrhage, mostly conservative management was advised and measures to reduce intra cranial pressure in the form of dexamethasone and mannitol were suggested.

In one case, right sided intra cerebral haematoma was evacuated with good results. Most of left sided intra cerebral haematomas were not evacuated surgically due to being dominant hemisphere as outcome after surgical intervention is not very encouraging. Heparin or streptokinase was not used. Tissue plasminogen activator (TPA) was out of question due to its unavailability and high cost in our setup. There are many studies about the dose of aspirin, and use of thrombolytic therapy, but the issue is still controversial however thrombolytic therapy can only be administered in specialized units⁴⁰.

There is a controversial role of neuroprotective agents although a number of trials are in progress but so far none of them have statistically significant outcome⁴¹. As regards mortality, a number of factors contributed including underlying cause, age of the patient level of consciousness, pattern of breathing (Cheyne Stoke) and other co-morbid conditions like aspiration pneumonia, urinary tract infections, deep venous thrombosis (DVT) and other nosocomial infections acquired during hospitalization. Increase in number of these factors or combination was direct proportion to mortality. A study on different predictors of worsening of neurological status discusses different parameters in detail⁴².

Majority of patients were unable to keep a regular followup due to various reasons.

The present study has shown various parameters which influence the stroke and its outcome and various risk factors including hypertension, diabetes, hypercholesterolaemia etc. which can be modified and prevent stroke. In our region haemorrhagic strokes are more common than ischaemic as compared to the west due to uncontrolled hypertension and bizarre eating habits. There is therefore, more need to educate people about preventing this disease and make them aware of the dreadful consequences.

In 1996 NSA/Gallup Survey on stroke awareness in the USA revealed following interesting facts:

- Among adults age 50 and above, 38% did not know where in the body a stroke occurs.
- 19% were unaware about stroke prevention strategies.
- Only 40% would call emergency help if they are having a stroke.

- Two-thirds were unaware of the short time frame in which a person must seek treatment.
- Only 3% correctly defined a TIA as a small stroke.
- 91% of the patients could not identify sudden blurring of one or both eyes.
- 85% of the patients could not identify loss of balance or coordination.
- 68% of the patients could not realize that they have difficulty in speech.
- 42% of the patients could not identify weakness/numbness/paralysis in the face, arm or leg.

Prevention is always better than cure as stroke can lead to long lasting disability. General practitioners and district health personnel can play an important role by early diagnosis, clinical and biochemical abnormalities and treat promptly. For this the mass media should be educated properly and electronic media can play an important role to teach pros and cons to the public. This becomes even more significant and utmost important after looking at the above mentioned facts from American community.

There should be specialized stroke units in large general hospitals well equipped with physiotherapy and rehabilitation programmes. These should have experts neurologists who can provide services immediately if needed. At national level, stroke associations should be devised to discuss the problems and national guidelines should be clearly laid down as National Stroke Association's (NSA) in the USA.

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