Study of Incidence, Risk Factors and Outcome of Acute Cerebrovascular Stroke Patients Admitted to Alexandria Main University Hospital

Ayman Y. E. Essa[1]; Tamer A. Helmy[*2] and Sameh S. A. El Batch[2]

[1] Neuropsychiatry Department; [2]Critical Care Medicine, Faculty of Medicine, University of Alexandria, Egypt
[*]tamer270103@hotmail.com

ABSTRACT: Background. Stroke is either hemorrhagic or ischemic. It could be divided into subtypes that have somewhat different causes, clinical pictures, courses, outcomes and treatment strategies. The most important historical item for differentiating stroke subtypes is the pace and course of the symptoms and signs and their clearing. Each subtype has a characteristic course. Intracerebral hemorrhage (ICH) does not improve during the early period, it progresses gradually during minutes or a few hours. Embolic strokes most often occur suddenly .The deficits indicate focal loss of brain function that is usually maximal at onset. Rapid recovery also favours embolism. Thrombosis-related symptoms often fluctuate, varying between normal and abnormal or progressing in a stepwise or stuttering fashion with some periods of improvement. Risk factors of acute cerebrovascular stroke are either non modifiable which include age, sex, and family history or modifiable which include hypertension, diabetes mellitus, hypercholesterolemia, hypertriglyceridemia, physical activity and smoking. Modification of these risk factors can reduce cerebrovascular disease risk considerably for the majority of the population. **The Aim of this Work** was to study the acute cerebrovascular stroke cases admitted to Alexandria Main University Hospital, six months prospective for assessment as data base regarding incidence, risk factors and outcome during hospital stay with the available routine lines of management. **Patients and Methods:** This study was conducted on 425 patients admitted to Alexandria main university hospital with acute cerebrovascular stroke in the period from the beginning of November 2008 to the end of April 2009. **Results:** The incidence of acute cerebrovascular stroke was highly significant in males compared to females. Acute cerebrovascular stroke was highly associated with hypertension, diabetes mellitus, smoking and atrial fibrillation. The incidence of hypertension and smoking were highly significant in males when compared to females but the incidence of diabetes mellitus was highly significant in females. Among patients admitted with acute cerebrovascular stroke, the incidence of cerebral infarction was highly significant intracranial hemorrhage. There was an increase in the incidence of cerebral infarction with the increase in age in a significant way. Also there was a decrease in the incidence of intracranial hemorrhage with the increase in age in a significant way. And the incidence of intracranial hemorrhage was highly significant in males compared to females. The incidence of hypertension, smoking and atrial fibrillation were highly significant in patients with cerebral infarction while the incidence of diabetes mellitus was highly significant in those with intracranial hemorrhage. Among patients admitted with acute cerebrovascular stroke, it was found that the mortality was highly significant among patients with hypertension, diabetes mellitus, smoking and atrial fibrillation. Regarding the relation between mortality and the types of acute cerebrovascular stroke it was found that the mortality was highly significant among patients with intracranial hemorrhage while the survival was highly significant among those with cerebral infarction. The need for mechanical ventilation and operative interference was highly significant in patients with intracranial hemorrhage than those with cerebral infarction, and it was found that the mortality was highly significant among patients who needed mechanical ventilation or operative interference during their hospital stay.

[Ayman Y. E. Essa; Tamer A. Helmy and Sameh S. A. El Batch **Study of Incidence, Risk Factors and Outcome of Acute Cerebrovascular Stroke Patients Admitted to Alexandria Main University Hospital**]. Journal of American Science 2011; 7(11):316-329]. (ISSN: 1545-1003). http://www.americanscience.org.

Keyword: incidence, risk factors, outcome, acute cerebrovascular, stroke patients

1. Introduction

The two broad categories of stroke, hemorrhage and ischemia, are diametrically opposite conditions: Haemorrhage is characterized by too much blood within the closed cranial cavity, while ischemia is characterized by too little blood to supply an adequate amount of oxygen and nutrients to a part of the brain .Each of these categories can be divided into subtypes that have somewhat different causes, clinical pictures, courses, outcomes, and treatment strategies [(1)]. Data compiled by the American Heart Association (AHA) show that the proportion of all strokes due to ischemia, intracerebral hemorrhage and subarachnoid hemorrhage are 88, 9, and 3 percent, respectively [(2)]. The annual incidence of new or recurrent stroke in the United States is about 700,000, of which about 500,000 are first-ever strokes, and 200,000 are recurrent strokes [(2)] .

Age is one of the strongest determinants of stroke, incidence rises with age, nearly doubling every decade after age 55, and the majority of strokes occur in persons older than 65 [3] . Stroke incidence is greater for men than women, with rates about 25% to 30% greater for men [4] .

Heart disease, including atrial fibrillation, valvular diseases, recent myocardial infarction, and endocarditis, increases the probability of a stroke due to embolism[5,6]. The risk of stroke rises proportionately with increasing blood pressure. Isolated systolic hypertension is increasingly prevalent with age and increases the risk of stroke by 2 to 4 times [4].

Smoking increases the likelihood of extracranial occlusive vascular disease, more than doubling the risk of stroke [7]. Diabetes increases the likelihood of large and small artery occlusive disease but apparently does not predispose to hemorrhage or to poor functional outcome [8].

Studies using ultrasound technology have established that total cholesterol or LDL cholesterol is directly associated and HDL cholesterol is inversely associated with extracranial carotid atherosclerosis and intima-media plaque thickness[9]. Incidence of stroke increases two times among first-degree relatives [10].

The most important historical item for differentiating stroke subtypes is the pace and course of the symptoms and signs and their clearing [11]. Each subtype has a characteristic course. Intracerebral hemorrhage (ICH) does not improve during the early period, it progresses gradually during minutes or a few hours. Embolic strokes most often occur suddenly .The deficits indicate focal loss of brain function that is usually maximal at onset. Rapid recovery also favors embolism. Thrombosis-related symptoms often fluctuate, varying between normal and abnormal or progressing in a stepwise or stuttering fashion with some periods of improvement. [12]

Outcome following stroke is influenced by a number of factors, the most important being the nature and severity of the resulting neurologic deficit. The patient's age, the cause of stroke, and coexisting medical disorders also affect prognosis. Overall, somewhat less than 80% of patients with stroke survive for at least 1 month, and 10-year survival rates in the neighborhood of 35% have been cited [13].

Aim of this work was to: study the acute cerebrovascular stroke cases admitted to Alexandria Main University Hospital, one years prospective for assessment as data base regarding incidence, risk factors and outcome during hospital stay with the available routine lines of management.

2. Patients

This study included patients admitted to Alexandria Main University Hospital, with acute cerebrovascular stroke, during six months interval for November 2008 till April 2009. An informed consent will be obtained from every patient included in the study or from the relatives.

Exclusion criteria:

1. Traumatic brain injury.
2. Patients refused to participate, but they will be included in the incidence if possible.

Methods

(I) The following data were collected on admission from all patients included in the present study:

1. Demographic data: including age and sex.
2. 2. Complete history taking including history of Hypertension, atrial fibrillation, Diabetes mellitus, smoking, previous ischemic heart disease, Dyslipidemias, positive family history, previous strokes and Drug history.
3. Complete clinical examination of General examination, Vital signs, Head, neck, Chest, Heart and Abdominal examination.
4. Complete neurological examination.
5. Twelve leads ECG.
6. Laboratory investigations of Complete blood picture [14], Sodium, Potassium [15], Blood urea nitrogen, serum creatinine, Blood sugar level (random and fasting), Aspartate aminotransferase, Alanine aminotransferase, Arterial blood gases [16] , Cholesterol, triglycerides and uric acid.
7. Radiological investigation:
   - Plain x-ray chest,
   - Computed tomography of brain on admission, after 48 hours.
   - MRI and CT angiography if needed.
8. National Institutes of Health Stroke Scale (NIHSS) [17].
9. Glasgow coma scale (GCS) [18].
10. Acute Physiology and Chronic Health Evaluation (APACH II score) [19].

(II) All the patients received the treatment of acute cerebrovascular stroke according to American Stroke Association guidelines 2007 for at least 10 days [20].

(III) Course and outcome during hospital stay Need for operative interference, Need for mechanical ventilation, Vegetative and locked in, Cure and discharge and Mortality.

Statistical Analysis

Data into the computer was done followed by tabulation and analysis. Analysis was done using SPSS-15 (Statistical package for Social Sciences version 15). [21]

3. Results

Demographic data of the studied patients (Table 1):

The commonest age group was between 45-65 years where in the age group below 45 years 112 patients (13.2%) had acute cerebrovascular stroke, in the age group older than 65 years 208 patients (24.5%) had acute CVS, while the number was high in the age group 45-65 where 530 patients (62.4%) had acute CVS and this was significantly high compared with the other age groups (p=0.0127). number of males with acute CVS were 620 patients (72.94%) and number of females with acute CVS were 230 patients (27.06%) and this was significantly high (p=0.0001).

Table 1: Demographic data of the studied patients

	No	Percent	Z-test
Age			
< 45 years	112	13.2%	5.65,
45 – 65 years	530	62.4*%	0.0127*
> 65 years	208	24.5%	
Sex			
Male	620	72.94%	12.3
Female	230	27.06%	0.0001*
Total	850	100.0%	

P* is significant if < 0.05

Prevalence of risk factors in the studied patients (Table 2):

Regarding risk stratification of the studied patients admitted to Alexandria main University Hospital with acute cerebrovascular stroke, hypertension, diabetes mellitus, smoking, atrial fibrillation were statistically significant with acute cerebrovascular stroke.

Table 2. Prevalence of risk factors in the studied patients (n = 425).

	No	Percent	Z-test
Hypertension			
No	98	11.5	0.001*
Yes	752	88.5	
Diabetes mellitus			
No	270	31.8	0.0021*
Yes	580	68.2	
Smoking			
No	210	24.7	0.0001*
Yes	640	75.3	
History of IHD			
No	474	55.8	>0.05
Yes	376	44.2	
Atrial fibrillation			
No	290	34.1	0.0023*
Yes	560	65.9	
Family history			
No	798	93.9	0.0001*
Yes	52	6.1	
History of previous strokes			
No	686	80.7	0.0021*
Yes	164	19.3	

P* is significant if < 0.05

Laboratory investigations of the studied patients (Table 3):

Regarding the Laboratory investigations of the studied patients, there were statistical significant differences between laboratory investigations and acute cerebrovascular stroke (*P*=0.00012).

Table 3. Laboratory investigations of the studied patients (n = 425).

	No	Percent	Z-test
Random blood sugar			
< 180 mg/dl	220	25.9	0.0082*
> 180 mg/dl	630	74.1	
Serum uric acid			
< 7 mg/dl	726	85.4	0.00012*
> 7 mg/dl	124	14.6	
Serum triglycerides			
< 165 mg/dl	224	26.4	0.0032*
> 165 mg/dl	626	73.6	
Serum cholesterol			
< 250 mg/dl	242	28.5	0.0049*
> 250 mg/dl	608	71.5	

P* is significant if < 0.05

Clustering of risk factors in the studied patients (Table 4):

When we studied the clustering of the conventional risk factors (hypertension, diabetes mellitus, smoking, and hypercholesterolemia >250mg/dl) in the studied patients, we found that only 20 patients (2.35%) had no risk factors compared to 152 patients (17.88%) who had one risk factor (hypertension) while those who had two risk factors (hypertension and diabetes mellitus) were 298 patients (35.06%) (p=0.0036) and those who had three risk factors (hypertension, diabetes mellitus and smoking) were 266 patients (31.29%) but those who had four risk factors (hypertension, diabetes mellitus, smoking, and hypercholesterolemia >250mg/dl) were only 114 patients (13.41%).

Table 4: Clustering of risk factors in studied patients

	No	Percent	Z-test
No risk factor	20	2.35	
One risk factor	152	17.88	
Two risk factors	298	35.06*	0.0036*
Three risk factors	266	31.29*	
Four risk factors	114	13.41	

P* is significant if < 0.05

Classification of patients according to the types of acute cerebrovascular stroke (Table 5):

It was found that the higher numbers were those with cerebral infarction 578 patients (68%) it showed a significant difference (*P* =0.021) if compared with patients with hemorrhage who were 272 patients (32%).

Table 5: Types of acute cerebrovascular stroke of studied patients.

	No	Percent	Z-test
Infarction	578	68.0	
Hemorrhage	272	32.0	0.021*

P* is significant if < 0.05

Relation between age groups and type of acute CVS (Table 6).

Regarding acute infarction there was significant increase in the incidence of acute infarction with increasing age.

Table 6. Relation between age groups and types of acute cerebrovascular stroke of the studied patients (n = 425).

Age group / Types	< 45 years		45 – 65 years		> 65 years		Total		
	No	%	No	%	No	%	No	%	X^2
Infarction	32	28.6	370	69.8	176	84.6	578	68.0	0.0012*
Hemorrhage	80	71.4	160	30.2	32	15.4	272	32.0	
Total	112		530		208		850		

P* is significant if < 0.05

Mean age of both genders (Table 7)

It was found that males were older than females as the mean age of male patients was 68.36±7.36 but that of female patients was 64.32±9.21 and this difference was not significant (*p* =0.32).

Table 7. Mean age of both genders

	No	Mean age	SD	t-test
Male	620	68.36	7.36	1.06
Female	230	64.32	9.21	0.32

P* is significant if < 0.05

Prevalence of risk factors in relation to sex (Table 8):

Regarding risk stratification of the studied patients in relation to sex we found that the prevalence of hypertension was significantly high in males.

Table 8. Prevalence of risk factors in relation to sex of the studied patients (n=425)

Sex / **Risk factors**	Male		Female		Total		
	No	%	No	%	No	%	X^2
Hypertension							
No	50	8.1	48	20.9	98	11.5	0.048*
Yes	570	91.9	182	79.1	752	88.5	
Diabetes mellitus							
No	242	39.0	28	12.2	270	31.8	0.0325*
Yes	378	61.0	202	87.8	580	68.2	
Smoking							
No	12	1.9	198	86.1	210	24.7	0.0032*
Yes	608	98.1	32	13.9	640	75.3	
History of IHD							
No	338	54.5	136	59.1	474	55.8	>0.05
Yes	282	45.5	94	40.9	376	44.2	
Atrial fibrillation							
No	164	26.5	126	54.8	290	34.1	>0.05
Yes	456	73.5	104	45.2	560	65.9	
Family history							
No	576	92.9	222	96.5	798	93.9	>0.05
Yes	44	7.1	8	3.5	52	6.1	
History of previous strokes							
No	530	85.5	156	67.8	686	80.7	>0.05
Yes	90	14.5	74	32.2	164	19.3	
Total	620		230		850		

P* is significant if < 0.05

Relations between sex and laboratory investigations (Table 9):

Regarding laboratory investigations in relation to sex we found that random blood sugar > 180 was significant in females compared to male patients (p=0.041), but regarding hyperuricemia, hypertriglyceridemia, there was no significant difference between both groups.

Table 9. Relations between sex and laboratory investigations of the studied patients (n=425)

Sex / Laboratory finding	Male		Female		Total		
	No.	%	No.	%	No.	%	X^2
Random blood sugar							
< 180 mg/dl	164	26.5	56	24.3	220	25.9	0.041*
> 180 mg/dl	456	73.5	174	75.7	630	74.1	
Serum uric acid							
< 7 mg/dl	562	90.6	164	71.3	726	85.4	>0.05
> 7 mg/dl	58	9.4	66	28.7	124	14.6	
Serum triglycerides							
< 165 mg/dl	136	21.9	88	38.3	224	26.4	>0.05
> 165 mg/dl	484	78.1	142	61.7	626	73.6	
Serum cholesterol							
< 250 mg/dl	164	26.5	78	33.9	242	28.5	0.029*
> 250 mg/dl	456	73.5	152	66.1	608	71.5	
Total	620		230		850		

P* is significant if < 0.05

Relation between sex and types of aute cerebrovascular stroke (Table 10):

Regarding the division of patients according to the types of acute cerebrovascular stroke in relation to sex there was significant difference between both groups regarding hemorrhage where 250 male patients (40.3%) compared to 22 female patients (9.6%) had hemorrhage (p=0.003), while there was no significant difference between both groups regarding infarction where 370 male patients (59.7%) compared to 208 female patients (90.4%) had infarction (p>0.05).

Table 10. Relation between sex and types of acute cerebrovascular stroke of the studied patients (n = 425).

Sex / Types	Male		Female		Total		
	No.	%	No.	%	No.	%	X^2
Infarction	370	59.7	208	90.4	578	68	>0.05
Hemorrhage	250	40.3	22	9.6	272	32	0.003*
Total	620		230				

P* is significant if < 0.05

Prevalence of risk factors in different types of acute cerebrovascular stroke (Table 11)

Regarding risk factors of acute cerebrovascular stroke in relation to the types of acute cerebrovascular stroke we found that hypertension was significant high in patients with infarction, the same for smoking and interestingly diabetes mellitus was significant high in patients with hemorrhage, also there was significant difference between types of acute cerebrovascular stroke and the incidence of atrial fibrillation.

Relations between the types of acute CVS and laboratory investigations (Table 12):

Regarding laboratory investigations in relation to the types of acute cerebrovascular stroke we found that hyperglycemia (RBS>180) on admission was significant difference between types of acute CVS where 418 patients (72.3%) with infarction and 212 patients (77.9%) with hemorrhage had hyperglycemia (p=0.008), the same for hypercholesterolemia where 168 patients (61.8%) with hemorrhage and 440 patients (76.1%) with infarction had serum total cholesterol > 250 mg/dl (p=0.022), but there was no significant difference between hyperuricemia (serum uric acid > 7) and the types of acute CVS where 104 patients (18.0%) with infarction and 20 patients (7.4%) with hemorrhage had hyperuricemia (p>0.05), the same also for hypertriglyceridemia was not significant (p>0.05).

Table 11: Prevalence of risk factors in different types of acute CVS

Types / Risk factors	Infarction		Hemorrhage		Total		X^2
	No.	%	No.	%	No.	%	
Hypertension							
No	40	6.9	58	21.3	98	11.5	0.021*
Yes	538	93.1	214	78.7	752	88.5	
Diabetes mellitus							
No	192	33.2	78	28.7	270	31.8	0.031*
Yes	386	66.8	194	71.3	580	68.2	
Smoking							
No	112	19.4	98	36.0	210	24.7	0.022*
Yes	466	80.6	174	64.0	640	75.3	
History of IHD							
No	332	57.4	142	52.2	474	55.8	>0.05
Yes	246	42.6	130	47.8	376	44.2	
Atrial fibrillation							
No	124	21.5	166	61.0	290	34.1	0.0032*
Yes	454	78.5	106	39.0	560	65.9	
Family history							
No	554	95.8	244	89.7	798	93.9	>0.05
Yes	24	4.2	28	10.3	52	6.1	
History of previous strokes							
No	482	83.4	204	75.0	686	80.7	>0.05
Yes	96	16.6	68	25.0	164	19.3	
Total	578		272		850		

P* is significant if < 0.05

Table 12. Relation between the types of acute CVS and laboratory investigations of the studied patients (n = 425).

Types / Laboratory investigation	Infarction		Hemorrhage		Total		X^2
	No.	%	No.	%	No.	%	
Random blood sugar							
< 180 mg/dl	160	27.7	60	22.1	220	25.9	0.008*
> 180 mg/dl	418	72.3	212	77.9	630	74.1	
Serum uric acid							
< 7 mg/dl	474	82.0	252	92.6	726	85.4	>0.05
> 7 mg/dl	104	18.0	20	7.4	124	14.6	
Serum triglycerides							
< 165 mg/dl	156	27.0	68	25.0	224	26.4	>0.05
> 165 mg/dl	422	73.0	204	75.0	626	73.6	
Serum cholesterol							
< 250 mg/dl	138	23.9	104	38.2	242	28.5	0.022*
> 250 mg/dl	440	76.1	168	61.8	608	71.5	
Total	578		272		850		

P* is significant if < 0.05

Prevalence of mortality in relation to age group (Table 13)

There was highly significant difference regarding mortality in the different age groups where 24 patients (21.4%) aged below 45, 58 patients (10.9%) in the age group 45-65 and 134 patients (64.4%) older than 130 years died during hospitalization period (p=0.0001).

Table 13. Prevalence of mortality in relation to age group of the studied patients.

Mortality	Age group						Total	X^2 p
	< 45		45 – 65		> 65			
	No.	%	No.	%	No.	%		
Survivors	176	78.6	472	89.1	74	35.6	1268	24.65
Non- Survivors	48	21.4	58	10.9	134	64.4	432	0.0001*
Total	224		1060		416		1700	

P* is significant if < 0.05

Comparison between survivors and non-survivors in relation to sex (Table 14):

There was no significant difference regarding mortality between males and females (p=0.299).

Table 14. Comparison between survivors and non-survivors regarding sex.

Mortality	Males		Females		Total	X^2, p
	No.	%	No.	%		
Survivors	1004	32.1	424	45.1	1428	1.68
Non- Survivors	236	31.1	196	20.9	432	0.299
Total	1240		460		1700	

P* is significant if < 0.05

The impact of individual risk factors on mortality of the studied patients (Table 15):

We found that there was significant difference between survivors and non survivors regarding the prevalence of some risk factors.

Table 15. The impact of individual risk factors on mortality of the studied patients

	Survivors		Non Survivors		Total		
	No.	%	No.	%	No.	%	X^2
Hypertension							
No	90	14.2	8	3.7	98	11.5	0.0018*
Yes	544	85.8	208	96.3	752	88.5	
Diabetes mellitus							
No	244	38.5	26	12.0	270	31.8	0.009*
Yes	390	61.5	190	88.0	580	68.2	
Smoking							
No	172	27.1	38	17.6	210	24.7	0.021*
Yes	462	72.9	178	82.4	640	75.3	
History of IHD							
No	304	47.9	170	78.7	474	55.8	0.031*
Yes	330	52.1	46	21.3	376	44.2	
Atrial fibrillation							
No	250	39.4	40	18.5	290	34.1	0.011*
Yes	384	60.6	176	81.5	560	65.9	
Family history							
No	596	94.0	202	93.5	798	93.9	>0.05
Yes	38	6.0	14	6.5	52	6.1	
History of previous strokes							
No	596	94.0	90	41.7	686	80.7	0.001*
Yes	38	6.0	126	58.3	164	19.3	
	634		216				

P* is significant if < 0.05

The impact of individual laboratory investigations on mortality (Table 16)

There was significant difference between survivors and non survivors regarding the prevalence of abnormal laboratory investigations.

Relations between mortality and types of acute cerebrovascular stroke (Table 17):

Regarding the relation between mortality and the types of acute cerebrovascular stroke it was

found that the mortality was highly significant among those with hemorrhage where 184 patients (85.2%) of the died patients had hemorrhage while 32 patients (14.8%) had infarction (p=0.0001).

Table 16. The impact of individual laboratory investigations on mortality of the studied patients (n=425).

	Survivors		Non Survivors		Total		
	No.	%	No.	%	No.	%	X^2
Random blood sugar							
< 180 mg/dl	198	31.2	22	10.2	220	25.9	0.036*
> 180 mg/dl	436	68.8	194	89.8	630	74.1	
Serum uric acid							
< 7 mg/dl	596	94.0	130	60.2	726	85.4	0.012*
> 7 mg/dl	38	6.0	86	39.8	124	14.6	
Serum triglycerides							
< 165 mg/dl	200	31.5	24	11.1	224	26.4	0.011*
> 165 mg/dl	434	68.5	192	88.9	626	73.6	
Serum cholesterol							
< 250 mg/dl	184	29.0	58	26.9	242	28.5	0.025*
> 250 mg/dl	450	71.0	158	73.1	608	71.5	
Total	634		216		850		

P* is significant if < 0.05

Table 17. Relations between mortality and types of acute cerebrovascular stroke of the studied patients (n = 425).

	Survivors		Non- Survivors		Total	X^2 , p
	No.	%	No.	%		
Infarction	546	86.1	32	14.8	578	28.98 0.0001*
Hemorrhage	88	13.9	184	85.2	272	
Total	634		216			

P* is significant if < 0.05

Relations between mortality and clinical severity of studied patients (Table 18):

There was highly significant relation between clinical severity on admission of studied patients and mortality.

Table 18. Relations between mortality and clinical severity of studied patients (n=425)

	Survivors	Non-Survivors	t , p
NIHSS			
Range	4 – 24	13 – 23	
Mean	12.65	20.03	3.52,
S.D.	3.98	3.01	0.001*
GCS			
Range	3 – 15	3 – 12	
Mean	10.36	6.26	4.09,
S.D.	4.03	2.455	0.0001*
APACHE II			
Range	3 – 28	16 – 36	
Mean	13.65	22.61	4.17,
S.D.	4.25	4.78	0.0001*

P* is significant if < 0.05

Relations between types of acute cerebrovascular stroke and need for mechanical ventilation (Table 19):

We found that there was significant difference between types of acute cerebrovascular stroke and the need for mechanical ventilation where 204 patients (56%) with infarction and 160 patients (44%) with hemorrhage needed for mechanical ventilation during their hospital stay (p=0.025).

Table 19. Relations between types of acute CVS and need for mechanical ventilation

Mechanical ventilation Types	Need for mechanical ventilation		Z-test
	No	Percent	
Infarction	204	56.0	0.025*
Hemorrhage	160	44.0	
Total	364	100.0	

P* is significant if < 0.05

Relations between types of acute cerebrovascular stroke and need for operative interference (Table 20).

We found that there was significant difference between types of acute cerebrovascular stroke and the need for operative interference (p=0.0288).

Table 20. Relations between types of acute CVS and need for operative interference

Operative interference / Types	Need for operative interference		Z-test
	No	Percent	
Infarction	50	33.3	0.0288*
Hemorrhage	80	53.3	
Total	150	100.0	

P* is significant if < 0.05

The impact of mechanical ventilation on outcome of studied patients (Table 23)

Regarding the relation between mortality and the need for mechanical ventilation it was found that the mortality was highly significant among those who need for mechanical ventilation where 224 patients (61.5%) died and 140 patients (38.5%) survived (p=0.001).

Table 21. Relations between mortality and need for mechanical ventilation

	Need for mechanical ventilation		Z-test
	No	Percent	
Survivors	140	38.5	0.001*
Non-survivors	224	61.5	
Total	364	100.0	

P* is significant if < 0.05

The impact of operative interference on outcome of studied patients (Table 22):

Regarding the relation between mortality and the need for operative interference, it was found that the mortality was highly significant among those who need for operative interference where 100 patients (66.7%) died and 50 patients (33.3%) survived (p=0.0085).

Table 22. Relations between mortality and need for operative interference

	Need for operative interference		Z-test
	No	Percent	
Survivors	50	33.3	0.0085*
Non survivors	100	66.7	
Total	150	100.0	

P* is significant if < 0.05

The mortality and survival of studied patients (Table 23):

At the end of this study total number of patients who survived was 317 where 235 patients (55.3%) were cured and discharged, 124 patients (14.6%) were vegetative and 40 patients (4.7%) were locked in. while 216 patients (25.4%) died during hospital stay.

Table 23. Mortality and survival.

	No	%	Z-test
Survivors			0.0211*
Vegetative	124	14.6	
Locked in	40	4.7	
Cured	470	55.3*	
Non -Survivors	216	25.4	

P* is significant if < 0.05

4. Discussion

The current study was conducted on 425 patients presented with acute cerebrovascular stroke. Male patients in this study constituted 72.94% while female patients constituted 27.06% of the studied patients. **Mumtaz, *et al*** [22] studied 88 patients with acute cerebrovascular stroke in Department of Medicine, Saidu Teaching Hospital Swat, Pakistan, from January 2006 to December 2006 where male constituted 70.4 % and female 29.6%. In the study done by **Salma *et al*** [23] Between April 1st 1997 and March 31st 1998, 281 patients with first ever stroke admitted in Dr. Ziauddin Medical University Hospital North Nazimabad Campus, Karachi where male patients constituted 71 % and female patients 29%. Among the 401 patients with acute CVS studied by **Somay *et al*** [24] in Turkey 70.6% were males while 29.4% were females. And in the study done by **Osuntokun *et al*** [25] 318 patients admitted with acute CVS in Africa where male patients constituted 70 % and female patients 30%. It appears from the results of the previous studies as well as the current study that males were more than females admitted with acute CVS.

In the present study, the mean age of patients with acute CVS as reported by **Mumtaz, *et al*** [22] in their study in Department of Medicine, Saidu Teaching Hospital Swat Pakistan was 65.9±9.15.

In the present study 88.5% of those admitted with acute cerebrovascular stroke had history of hypertension. In the study done by **Mumtaz, *et al*** [22], the prevalence of hypertension was 75% among patients admitted with acute CVS.

In the present study diabetes mellitus constituted 68.2% of the acute cerebrovascular stroke patients and this is a high percentage compared to other studies. In the study done by **Mumtaz Ali Marwat, *et al*** [22], the prevalence of DM was 54.5% among patients admitted with acute CVS.

Smoking was significantly associated with acute cerebrovascular stroke in the present study where 75.3% of the patients were smokers and this was similar to what Salma et al [23] had found that the estimated relative risk for stroke among smokers is 1.5 to 2.9 times that of nonsmokers where the prevalence of smoking among acute CVS admissions was 53%. D'Alessandro *et al* [26] in Italy reported that exposure to cigarette smoke is associated with significant increase in cerebrovascular stroke risk where the prevalence of smoking among patients with acute CVS was 21%.

In the present study patients with history of ischemic heart disease were 44.2%. This was similar to what Somay *et al* [24] reported in their study in Turkey where 40.1% of the patients with acute cerebrovascular stroke had history of IHD.

In the present study atrial fibrillation was significantly high among acute cerebrovascular stroke patients where 65.9% of the patients had atrial fibrillation. In the study done by D'Alessandro *et al*[26] in Italy the prevalence of atrial fibrillation was 18% among patients admitted with acute CVS. The difference between the current study and the previous study may reflect the high number of patients with atrial fibrillation in the current study.

In the present study positive family history was not significantly among acute cerebrovascular stroke patients where 6.1% of the patients had positive family history of CVS. And this was similar to what Salma *et al* [23] had found that positive family history was not significantly among acute cerebrovascular stroke patients.

In the present study history of previous strokes was not significantly among acute cerebrovascular stroke patients where 19.3% of the patients had history of previous strokes. And this was similar to what Salma *et al* [23] had found that 22% of the patients had history of previous strokes.

In the present study, Patients with high triglyceride level (>165 mg/dl) constituted 73.6%of the studied patients and it was significantly associated with acute CVS. In the study done by Kagan *et al.* [27] in Japan in a case-control study, along with blood pressure, also found triglycerides to be an important risk factor in those with normal glucose tolerance tests, and in those with abnormal glucose tolerance tests in patients with acute cerebrovascular stroke.

In the present study hypercholesterolemia was significantly associated with acute cerebrovascular stroke where it was present in 71.5% of the patients. In the study done by Salma *et al* [23] found that, the prevalence of hypercholesterolemia was 45.5% among patients admitted with acute cerebrovascular stroke, but it was 53.7% in the study done Somay *et al* [24] in Turkey.

In the present study when we studied the clustering of the conventional risk factors in the studied patients we found that only 10 patients (2.35%) had no risk factors and 17.8% of the patients had at least one risk factor and about 35.06% of the patients had at least two risk factors. In the study of Mumtaz *et al* [22] found that, only16% of the patients with acute CVS had at least one risk factor and 36.3% of the patients had at least two risk factors.

In the current study it was found that the number of the patients with cerebral infarction was 289 patients (68.0%). This showed a significant difference if compared with patients had intracranial hemorrhage who was 136 patients (32.0%). In the study of Mumtaz *et al* [189] 60% of patients had cerebral infarction and 40% had intracranial hemorrhage.

In the present study it was found that the incidence of hypertension is increasing with age where (42.9%) of patients below the age of 45 had hypertension, this incidence increased to (95.1%) in the age group 45-65, and increased more to (96.2%) in the age group >65 years and this was statistically significant. In the study done by Yan *et al*. [28] in Canada the incidence of hypertension among patients with acute cerebrovascular stroke increased with age where hypertension was present in 41.6% of patients aged < 65, this incidence increased to 53.5% in patients aged 65-74, and increase more to 60.2% of patients > 75 years. The current study was in accordance to the previous study showing that among patients with acute cerebrovascular stroke the incidence of hypertension increased with the increase in age.

In the present study it was found that the incidence of smoking was very high (80.4%) in the aged group 45-65years, this incidence was decreased to (70.2%) in the age group older than 65 years and this difference was highly significant. In the study done by Yan *et al***.** [28], the same trend was recorded in patients with acute CVS where the incidence of smoking was 44.9% in patients aged <65 then decreased to 20.3% in patients aged 65-74 and to 8.9% in patients > 75 years. The current study is in agreement to the previous study showing that the incidence of smoking among patients with acute cerebrovascular stroke decreased with advancing age.

In the present study it was found that high level of serum TG was found to be significantly more common in older age groups. Patients below the age of 45 had the lowest incidence where 53.6% had high level of serum TG, this incidence increased in the age group 45-65 to 76.6%, and to 76.9% in the age group > 65 years and this goes in line with the findings of Malmberg *et al.* [29] in their study.

In the present study incidence of cerebral infarction increased with advancing age where 28.6% of the patients <45 years, 69.8% of the patients between 45-65 years and 84.6% of the patients older than 65 years but incidence of intracranial haemorrhage decreased with advancing age where71.4% of the patients <45 years, 30.2% of the patients between 45-65 years and 15.4% of the patients older than 65 years and it was statistically significant. In the study done by Somay *et al* [24] found that, on patients with acute CVS Yearly incidences of cerebral infarction according to age groups were1.7-3.6 /1000 people over the age of 55-64, 4.9-8.9/1000 people between ages of 65-74 and 13.5-17.9/1000 people over the age of 75 and intracranial haemorrhage rate was determined as

51.6% under 64years of age, and 48.4% over 64. In the study of Mumtaz, *et al*[22] incidence of cerebral infarction increased with advancing age where 2.3% in the age group 40-50, 27.2% in the age group 51-60 and 47.7% in the age group older than 60 years. The current study is in agreement to the previous studies showing that incidence of cerebral infarction increased with advancing age and incidence of intracranial haemorrhage decreased with advancing age.

In the present study it was found that males were older than females as the mean age of male patients was 68.36±7.36 but that of female patients was 64.32±9.21and this was in accordance with Mumtaz *et al* [22], Salma *et al* [190] and Somay *et al.* [24].

In the present study the incidence of hypertension was significantly high in males where 285 male patients (91.9%) were hypertensive compared to 91 female patients (79.1%). This is in accordance with the results of the studies published by Somay *et al.* [24] in Turkey who reported that the incidence of hypertension was more in males when compared to females in all types of acute cerebrovascular stroke where 55% male patients and 42% female patients admitted with acute CVS. It is clear from the previous study as well as the current study that among patients with acute CVS the incidence of hypertension is higher in males than in females.

In the present study the incidence of diabetes mellitus was highly significant in females where (87.8%) female patients were diabetic compared to (61.0%) male patients admitted with acute cerebrovascular stroke. This is in agreement with the results obtained from the studies of Somay et al [24] in Turkey who reported that the incidence of DM is more prevalent in females when compared to males in all types of acute CVS where 52.3% female patients compared to 45% male patients were diabetics.

In the present study, among patients with acute cerebrovascular stroke, smoking was significantly more prevalent in males where 304 male patients (98.1%) were smokers compared to 16 female patients (13.9%). This is similar to the findings in the studies done by **Somay *et al*.** [24] in Turkey where 76% male patients compared to 23% female patients were smokers. It is clear from the previous study as well as the current study that among patients with acute CVS, smoking is more prevalent in males than females.

In the present study the incidence of ischemic heart disease was high in males where 141 male patients (45.5%) compared to 47 female patients (40.9%) had history of ischemic heart disease. This is in agreement with the results obtained from the studies of **Somay *et al*.** [24] in Turkey who reported that the incidence of IHD was more in males when compared to females in all types of acute cerebrovascular stroke where 58.3% male patients and 41.6% female patients admitted with acute CVS.

In the present study the incidence of hypercholesterolemia was significantly high in males where 228 male patients (73.5%) compared to 76 female patients (66.1%) had hypercholesterolemia. This is in accordance with the results of the studies published by **Somay *et al*.** [24] in Turkey who reported that the incidence of hypercholesterolemia was more in males when compared to females in all types of acute cerebrovascular stroke where 51.2% male patients and 48.7% female patients admitted with acute CVS. It is clear from the previous study as well as the current study that among patients with acute CVS the incidence of hypercholesterolemia is higher in males than in females.

In the present study the incidence of intracranial hemorrhage was significantly high in males where 125 male patients (40.3%) compared to 11 female patients (9.6%) had intracranial hemorrhage while the incidence of cerebral infarction was not significantly different between males and females. This is in agreement with the results obtained from the studies of **D'Alessandro *et al*** [26] in Italy where 44% male patients compared to 14% female patients admitted with intracranial hemorrhage. In the study done by **Ashok *et al.*** [30] 60 male patients and 18 female patients admitted with intracranial hemorrhage and it was statistically significant. In the study done by **Ueda *el al*** [31] 49% male patients compared to 16% female patients admitted with intracranial hemorrhage. This is in accordance with the results of the studies published by **Somay *et al.*** [24] in Turkey who reported that the incidence of intracranial hemorrhage was more in males when compared to females where 47% male patients compared to 13% female patients admitted with intracranial hemorrhage. It is clear from the previous studies as well as the current study that among patients with acute CVS the incidence of intracranial hemorrhage is higher in males than in females.

In the present study hypertension was significantly more prevalent in patients with cerebral infarction than those with intracranial haemorrhage where 269 patients (93.1%) had cerebral infarction compared to 107 patients (78.7%) had intracranial haemorrhage were hypertensive. This is in accordance with the studies of **Kagan *et al.*** [195] who reported that the incidence of hypertension was significantly higher in patients with cerebral infarction when compared to intracranial

haemorrhage. In the study done by **Salma et al** [23] hypertension was present in 65% of patients with cerebral infarction, 70% of patients with intracranial haemorrhage and this was not significant.

In the present study diabetes mellitus was significantly more prevalent in patients with intracranial haemorrhage than those with cerebral infarction where 71.3% had intracranial haemorrhage and 66.8% had cerebral infarction were diabetics. This is in agreement with the results obtained from the studies of **Salma *et al.*** [23] and Kagan et al [27] in Japan who reported that the incidence of diabetes mellitus was significantly higher in patients with intracranial haemorrhage than those with cerebral infarction.

In the present study smoking was significantly more prevalent in patients with cerebral infarction than those with intracranial haemorrhage where 233 patients (80.6%) had cerebral infarction compared to 87 patients (64.0%) had intracranial haemorrhage were smokers. This is in accordance with the studies of **Kagan *et al.*** [27] in Japan who reported that the incidence of smoking was significantly higher in patients with cerebral infarction when compared to intracranial haemorrhage. In the study done by **Salma et al** [23] showed that, smoking was present in 44% of patients with cerebral infarction, 16% of patients with intracranial haemorrhage. It is clear from the previous studies as well as the current study that among patients with acute cerebrovascular stroke the incidence of smoking is higher in cerebral infarction than in intracranial haemorrhage.

In the present study the incidence of atrial fibrillation was significantly more prevalent in patients with cerebral infarction than those with intracranial haemorrhage where 227 patients (78.5%) with cerebral infarction compared to 53 patients (39.0%) had atrial fibrillation. This is in accordance with the studies of **Salma *et al*** [23] that 34% of patients with cerebral infarction and 17.9% of patients with intracranial haemorrhage had atrial fibrillation. It is clear from the previous study as well as the current study that among patients with acute cerebrovascular stroke the incidence of atrial fibrillation is higher in cerebral infarction than in intracranial haemorrhage.

In the present study the incidence of hypercholesterolemia was significantly high in patients with cerebral infarction than those with intracranial haemorrhage where 220 patients (76.1%) with cerebral infarction compared to 84 patients (61.8%) with intracranial haemorrhage had hypercholesterolemia. This is in agreement with the results obtained from the studies of **Kagan *et al.*** [195] in Japan who reported that the incidence of hypercholesterolemia was significantly higher in patients with cerebral infarction when compared to intracranial haemorrhage. In the study done by **Salma et al** [23] found that, among patients with acute cerebrovascular stroke the incidence of hypercholesterolemia was not significant different between cerebral infarction and intracranial haemorrhage.

In the present study it was found that mortality was highly significant among those aged older than 65 years. This is in accordance with the findings reported by **Ashok *et al.*** [30]. In the study done by **Lan, *et al*** [32] found that, the mortality was highly significant among those aged older than 60 years. Also in the studies done by **Chen, *et al*** [33], **Salma *et al*** [23] and **Mumtaz, *et al*** [22] mortality was highly significant among those aged older than 65 years where 77.8% of the died patients aged older than 65 years.

In the present study there was no significant difference regarding mortality between males and females where 59 male patients (31.1%) compared to 49 female patients (20.9%) died during hospitalization period. This is in agreement with the results obtained from the studies of **Lan, *et al*** [32] **Chen, *et al*** [33], **Somay *et al.*** [24], **Birgitta *et al*** [34] and **Rosamond *et al.*** [206].

In the present study hypertension had a significant impact on mortality. This is in agreement with the results obtained from the studies of **Lan, et al** [32] found that, 88% of the mortality was encountered in those with hypertension and only in 49% of the survivors. Also in the study done by **Chen, *et al*** [33] that the mortality was highly significant among hypertensive patients admitted with acute cerebrovascular stroke.

In the present study mortality was highly significant in diabetic patients where among patients with diabetes mortality comprised 88.0% and survival comprised 61.5%.In the study done by **Lan, *et al*** [32] mortality was highly significant among diabetic patients admitted with acute cerebrovascular stroke. In the study done by **Chen, et al** [33] diabetes mellitus had a significant impact on mortality.

In the current study it was found that smoking had a serious impact on mortality where 82.4% of the mortality was encountered in smokers and only in 72.9% of the survivors. This is in agreement with the results obtained from the studies of **Lan, *et al*** [32] and **Chen, et al** [33].

In the present study mortality was highly significant in patients had history of previous strokes where 58.3% died and 6.0% survived among those patients admitted with acute cerebrovascular stroke. This is in accordance with the studies of **Lan, *et al*** [32] and **Chen, et al** [33] It is clear from the previous studies as well as the current study that among

patients with acute cerebrovascular stroke the history of previous strokes had a significant impact on mortality.

In the current study it was found that hypercholesterolemia had a significant impact on mortality where 73.1% of the mortality was encountered in patients with hypercholesterolemia and only in 71.0% of the survivors. This is in agreement with the results obtained from the studies of **Lan, *et al*** [203] and **Chen, *et al*** [204].

In the present study mortality was highly significant in patients had high level of serum TG where 88.9% died and 68.5% survived among those patients admitted with acute cerebrovascular stroke. This is in accordance with the studies of **Lan, et al**[32] and **Chen, et al** [33] It is clear from the previous studies as well as the current study that among patients with acute cerebrovascular stroke high level of serum TG had a significant impact on mortality.

In the present study it was found that the mortality was highly significant among those with intracranial hemorrhage where 92 patients (85.2%) of the died patients had intracranial hemorrhage while 16 patients (14.8%) had cerebral infarction. This is in accordance with the studies of **Salma et al** [23] found that, where 20 patients (23.8%) of the died patients had intracranial hemorrhage while 13 patients (6.6%) had cerebral infarction. In the study done by **Ueda el al** [31] found that, the mortality was highly significant among those with intracranial hemorrhage than cerebral infarction. In the study done by **Ashok *et al.*** [30] 35% of the died patients had intracranial hemorrhage while 13% had cerebral infarction. It is clear from the previous studies as well as the current study that among patients with acute cerebrovascular stroke the mortality was highly significant among those with intracranial hemorrhage than with cerebral infarction.

In the present study there was highly significant relation between clinical severity on admission of studied patients with acute cerebrovascular stroke and mortality. Regarding National Institutes of Health Stroke Scale (NIHSS), it was found that mean (NIHSS) was 20.03±3.01 of the died patients and 12.65±3.98 of the survived patients. Regarding Glasgow coma scale (GCS), the mean (GCS) was 6.26±2.455 of the died patients and 10.36±4.03 of the survived patients. Lastly as regard Acute Physiology and Chronic Health Evaluation (APACH II score), it was found that mean (APACH II score) was 22.61±4.78 of the died patients and 13.65±4.25 of the survived patients. This is in accordance with the studies of **Lan, et al**[32], **Chen, et al** [33], **Salma et al**[23] and **Nedeltchev *et al.***[36]. It is clear from the previous studies as well as the current study that the severity of stroke on admission has significant impact on mortality.

In the present study it was found that there was significant difference between types of acute cerebrovascular stroke and the need for mechanical ventilation. This is in accordance with the studies of **Stephan et al** [37] where 65% of mechanically ventilated patients with acute cerebrovascular stroke died during hospital stay and most survivors were severely disabled. In the study done by **Moussa et al** [38] 60% of patients with cerebral infarction and 40% of patients with intracranial hemorrhage needed for mechanical ventilation while 70% of mechanically ventilated patients died during hospital stay. It is clear from the previous studies as well as the current study that among patients with acute cerebrovascular stroke the need for mechanical ventilation had a significant impact on mortality.

In the present study it was found that there was significant difference between types of acute cerebrovascular stroke and the need for operative This is in agreement with the results obtained from the studies of **Moussa et al** [38] found that, 69.5% of patients needed for operative interference died during hospital stay.

In the present study among patients admitted with acute cerebrovascular stroke 235 patients (55.3%) were cured and discharged, 62 patients (14.6%) were vegetative and 20 patients (4.7%) were locked in. while 108 patients (25.4%) died during hospital stay. This is in accordance with the studies of **Mumtaz, et al**[22] on acute cerebrovascular stroke patients where 60% were cured, 14.9% were vegetative, 5.1% were locked in and 20% died during hospital stay.

Corresponding author
Tamer A. Helmy
Critical Care Medicine, Faculty of Medicine, University of Alexandria, Egypt
tamer270103@hotmail.com

References

1. Caplan LR. Intracranial branch atheromatous disease: A neglected, understudied, and concept. underused Neurology; 1989; 39:1246.
2. Thom T, Haase N, Rosamond W. Heart disease and stroke statistics-2006 update: a report from the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. Circulation; 2006; 113: 85.
3. American Heart Association. 7999 Heart and Stroke Statistical Update. Dallas: American Heart Association,. 1989
4. Sacco RL, Benjamin EJ, Broderick JP. Risk Factors, American Heart Association Prevention Conference IV. Stroke; 1997; 28:1507:17.

5. Wein TH, Bornstein NM. Stroke prevention: cardiac and carotid-related stroke. Neurol Clin.; 2000; 18:321.
6. Di Tullio MR, Homma S.. Mechanisms of cardioembolic stroke. Curr Cardiol Rep.; 2002; 4:141
7. Kawachi I, Colditz GA, Stampfer, MJ. Smoking cessation and the decreased risk of stroke in women. JAMA; 1993; 269:232.
8. Karapanayiotides T, Piechowski-Jozwiak B, van Melle G. Stroke patterns, etiology, and prognosis in patients with diabetes mellitus. Neurology; 2004; 62:1558.
9. Dempsey RJ, Diana LA, Moore LD. Thickness of carotid artery atherosclerotic plaque and ischemic risk. Neurosurgery; 1990; 27:343.
10. Halim A, Ottman R, Logroscino G. Familial aggregation of ischemic stroke in the Northern Manhattan Stroke Study. Neurology; 1997; 48:161.
11. Caplan LR. Caplan's stroke, a clinical approach, 3rd ed, Butterworth-Heinemann, Boston; 2000; 17.
12. Caplan LR, Gorelick PB, Hier DB. Race, sex, and occlusive vascular disease: A review. Stroke; 1996; 17:648
13. Weimar C, Mieck T, Buchthal J. Neurologic worsening during the acute cerebrovascular stroke. Arch Neurol.; 2005; 62:393.
14. Ward PC. The CBC at the turn of the millennium. Clin Chem.; 2000; 46:1215.
15. Rose BD, Post TW. Clinical Physiology of Acid-Base and Electrolyte Disorders, 5th ed, McGraw-Hill, New York; 2001; 716:19.
16. Williams AJ. ABC of oxygen - Assessing and interpreting arterial blood gases and acid-base balance. BMJ; 1998; 317:98.
17. Brott T, Adams HP Jr, Olinger CP. Measurements of acute cerebral infarction: a clinical examination scale. Stroke.; 1996; 864:70.
18. Teasdale G, Jennett B. Assessment of coma and impaired consciousness: a practical scale. Lancet.; 1997; 2:81-84.
19. Capuzzo M, Valpondi V, Sgarbi A. Validation of severity scoring systems SAPS II and APACHE II in a single-center population. Intensive Care Med; 2000; 26:1779.
20. Harold P Adams, Gregory del Zoppo, Mark J Alberts, Stroke 2007; 38: 1655-1711.
21. Stockburger DW. Introductory Statistics: Concepts, Models and Applications. 3rd ed. Atomic Dog Publishing 2007.
22. Mumtaz Ali Marwat, Muhammad Usman, Muhammad Hussain Gomal Journal of Medical Sciences January-June 2009, Vol. 7, No. 1.
23. Hatano S. Control of stroke in the community, Methodological consideration and protocol of WHO stroke register. Geneva WHO 1973; document no. CVD/S/73.6 Rev.1
24. G.somay, Ozkaya B, Sagduyu A, et al. The Ege Stroke Registry: A Hospital-Based Study in the Aegean Region, Izmir, Turkey. Cerebrovascular Dis1998; 8: 278-88.
25. BO Osuntokun, Bademosi, Akinkugbe, et al. R Carlisle Stroke 1999; 10:205-07.
26. G D'Alessandro, M Di Giovanni, L Roveyaz, et al.Stroke 1999; 23:1712-05.
27. A Kagan, JS Popper and GG Rhoads Stroke 2000; 11:14-21.
28. Yan RT, Yan AT, Tan M, et al. Age-related differences in the management and outcome of patients with cerebrovascular stroke. Am Heart J 2006; 151:352-09.
29. Malmberg K, Bavenholm P, Hamsten A. Clinical and biochemical factors associated with prognosis after cerebral infarction at a young age. J Am Coll Cardiol, 1994; 24:592-09.
30. Ashok, Radhakrishnan, Sridharan, et al. Journal of Neurology, Neurosurgery and Psychiatry 1996; 49:519-23.
31. K Ueda, T Omae, Y Hirota, et al. Stroke 1999; 12:154-60.
32. Min-Yu Lan, Shu-Ju Wu Uchino K, Billheimer D. Entry criteria and baseline characteristics predict outcome in acute stroke trials. Stroke 2001; 32:909–16.
33. Chien-Hsun Li, Gim-Thean Khor, Chun-Hung Chen, et al. Stroke incidence, prevalence and survival: secular trends in Rochester, Minnesota, through 1989. Stroke 1996; 27:373–80.
34. Birgitta Stegmayr, Kjell Asplundh, Kari Kuulasmaa. International trends in stroke mortality. Stroke. 1999; 21:989-92.
35. Wayne D, Aaron R. Folsom, et al. Stroke incidence, prevalence and survival. Stroke 1999; 30:736-43.
36. Krassen Nedeltchev, Benjamin Schwegler, Tobias Haefeli. Outcome of cerebrovascular stroke. Stroke 2007; 38:2531-35.
37. Stephan Mayer, Daphne Copeland, Bernardini, et al. Cost and Outcome of Mechanical Ventilation for Life-Threatening Stroke. Stroke. 2000; 31:2346.
38. Moussa Riachy, Frida Sfeir, Ghassan Sleilaty, et al .Prediction of the survival and functional ability of severe stroke patients after ICU therapeutic intervention. BMC Neurol. 2008; 8: 24.

11/11/2011