Southern Egypt Stroke Study

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ABSTRACT

Background: Stroke now ranks as the second cause of death and the most common life threatening neurological disease. The best approach to reducing the burden of stroke remains prevention. Objectives: to determine the distribution of stroke in Upper Egypt by type, stroke risk factors, and to compare the results of the study with other national & international studies. Methods: prospective hospital-based study carried out in Neurology department of Sohag University hospital, involved 467 stroke patients. Patients were subjected to history taking, examination and investigation. Demographic data, stroke-subtypes, stroke-prone individual, risk factors, and stroke outcome, were analyzed and compared with other multi-center, national and international studies. Results: hemorrhagic strokes reported in 37.5%. 56.3% were above 60 years and 8.6% were below 40 years. 62% of stroke occurred in autumn-winter. Hemorrhagic stroke was higher in spring-summer. (53%). Stroke reported more in rural areas 57%. Non educated stroke patients were the commonest 67.5%, hypertension reported in 42% of patients, more in males 59%, especially in those >40 years (97.4%), smoking in 37.7%, ischemic heart diseases in 32.8%, dyslipidemia in 29.5%, history of TIA in 23.1% of. Diabetes in 21.6% of. Past history of similar stroke in 10.5%, obesity in 10.1%, Positive family history of stroke in 9.6%, atrial fibrillation in 6%, 60%. Rheumatic heart diseases reported in 5.6% of patients. Alcohol abuse reported in only 1.3% 66%. Conclusion: In Upper Egypt, we reported a higher incidence of Hemorrhagic stroke. Lower incidences of hypertension, D.M., hyperlipidemia, previous attacks and alcohol consumption compared with other studies, higher rates of Rh.H.D. were reported compared with other international studies. (Egypt J. Neurol. Psychiat. Neurosurg., 2005, 42(1): 255-269).

INTRODUCTION

Stroke now ranks as the second leading cause of death and the first cause of morbidity all over the world. Among all the neurological diseases of adult life, stroke clearly ranks first in frequency and importance, at least 50% of the neurological disorders in a hospitalized patients are of this type.¹²³ The burden of stroke was estimated by the American Heart Association to be 51 billion dollars direct and indirect costs in 1999⁴⁻⁵⁻⁶.

Despite advances in medical care of stroke and the advent of treatment of selected patients with acute ischemic stroke, prevention remains the best approach to reduce the burden of stroke High –risk or stroke-prone individuals can be identified and targeted for specific interventions⁷. This is important because epidemiological data suggest a substantial leveling off prior declines in stroke-related mortality and a possible increase in stroke incidence⁸⁻⁹. The prevalence of stroke is heterogeneous and is greater among the elderly and men and is variable from one region to others¹⁰.

Our aim was to study the pattern of stroke in upper Egyptian patients as regards the relative prevalence of different stroke-subtypes, the demographic data, and the prevalence of common stroke- risk factors. The study consisted of stroke patients admitted to Neurology Department of
Sohag University Hospital that is the main tertiary health care level among the southern governorates (Sohage, Kena, Aswan). The study was designed to be a prospective hospital based study.

**PATIENTS AND METHODS**

The study involved 467 stroke-patients. All patients of the study were subjected to the following:

* Detailed history taking
* Thorough general and neurological examinations
* Cranial computed tomography scanning using CT equipment Siemens, Somatom, HQS, VB2, 1993, with tissue matrix=256x256, one second scanning time, and 10 mm slice thickness.

Stroke subtype was diagnosed, and non-stroke patients were excluded.

* The following investigations were done to define risk factors:
  - Electrocardiography & Echocardiography to define relevant cardiac problems, history of myocardial infarction, coronary artery disease, congestive heart failure, arrhythmia, or valvular heart diseases.
  - Blood sugar: fasting blood sugar >=126 mg/dl, or random blood sugar>260 mg/dl, patient's self-report of diabetes, or use of antidiabetic drugs to define diabetes.
  - Complete lipogram: total cholesterol > 250 mg/dl, triglyceride > 175 mg/dl, low density lipoprotein > 170 mg/dl, high density lipoprotein < 30 mg/dl, to define hyper or dyslipidemia.

**The following risk factors were defined:**

- Hypertension: Reported systolic blood pressure >=140 mmHg, diastolic>=90, patient's self-report of hypertension, or use of antihypertensive drugs.
- Smoking: Active[curent] smoking according to smoking index parameters
- Alcohol abuse: Active
- Over-weight, obesity: Body mass index >=27 kg/m^2
- Family history [paternal & maternal] of stroke.
- Previous history of stroke or transient ischemic attacks.
- Education: Any level-yes or not.
- Oral contraceptives.
- Stresses: hours before stroke.
* Follow-up: For at least one month after stroke to define outcome [improved or died]
* Statistical analysis: Data coding & analysis using an SPSS program version were done, our results were analyzed using Odds Ratio, Risk limits, and P value and the results were compared with multicenter studies [Ain shams study, other national studies, western studies, and Northern Manhatten Stroke Study (NOMASS)]

**RESULTS AND DISCUSSION**

(Tables 1, 2, 3, 4) & (figure 1)

**Incidence of stroke and stroke subtypes**

There are much variations between different studies regarding stroke incidence where in U.S. population stroke incidence is between 0.5 to 1/1000 population\(^{11}\), while in Malmo, Sweden the incidence was reported to be lower 0.3/1000 population\(^ {12}\) but higher incidence rates was reported in U.K. (incidence is 2/1000/ population \(/y^{13}\)) and also in Copenhagen with incidence of 2.14/1000 population \(/y^{14}\), these variations in those different studies are mainly due to that, some of these studies are hospital based and others are community based and also due to the wide variations between different racial groups regarding stroke related risk factors. Where our study is a hospital based one and our patients were samples of southern Egypt populations, stroke incidence in this study could not be correctly assessed. Regarding stroke subtypes, we reported hemorrhagic stroke in 37.5% and infarction in 62.5% (p<0.001) .This proportion is one of the highest rates compared with other national studies, where in Ain shams study\(^ {15}\), it was 22% for
hemorrhage and 75% infarction, also our result is still higher than most of the international results where in Finland it was 83% for infarction and 17% for hemorrhage, also in another study in Finland it was reported to be 78.9% for infarction and 21.1% for hemorrhage, in England 83.1% for infarction and 16.9% for hemorrhage, in U.K. it was 86.3% for infarction and 13.7% for hemorrhage in Germany it was 78% for infarction and 22% for hemorrhage while in Japan it was 30.5% for hemorrhage and 69.5% for infarction, also in China it was reported to be 12 up to 48% for cerebral hemorrhage. It is well documented that the pathological patterns of stroke, stroke subtypes and stroke risk factors vary widely between racial groups (blacks, whites, hispanics), also these variations related risks may be related to environmental related risk factors or inherited risk factors. The possible reasons for the higher incidence of cerebral hemorrhage in southern Egypt population in our study include the following, firstly, most of the populations in southern Egypt belongs to blacks who usually carry a higher prevalence of hypertension as reported in other studies and this fact was reported in our study where hypertension reported in 55% in hemorrhagic stroke p<0.001% [odds ratio] O.R. > 1.6. Secondly, in southern Egypt, most of the populations are still following the traditional traits of marriage of related family members with consequence of inheritance of some of stroke related risk factors including hypertension, vascular malformations, interestingly in our study we reported higher incidence of positive family history (9.6%), and 29% of those with positive family history were presented with cerebral hemorrhage and most of those hemorrhagic strokes (nearly 35% of them), their CT or MRI showed large lobar and/or intraventricular hemorrhage with great possibility of rupture of underlying vascular malformations. Previous reports stated that the site of hemorrhage shown on CT provides some clue to the cause, where hypertensive hemorrhage tend to occur slightly more in the basal ganglia, thalamus and pons, while lobar hemorrhage tend to be more often due to cerebral amyloid angiopathy, vascular malformations, and hemostatic failure. Also primary ventricular hemorrhage may be due more often to vascular malformation. Intracranial vascular malformations are properly congenital or familial. A few strokes are clearly familial with a simple Mendelian pattern of inheritance of the underlying cause. Also there is evidence that paternal history of stroke is a risk factor.

Thirdly, the effect of the characteristic higher environmental temperature of southern Egypt, in this high temperature climates, CNS dysfunction may occur including intracerebral hemorrhage, this dysfunction can be explained by a number of mechanisms including the effects of interleukin 1 and other cytokines and the excessive amounts of the released exitotoxic glutamets and that was reported in our study where cerebral hemorrhage reported more in summer (46.6%)

Non modifiable risk factors (Risk markers)

Age, sex, race, family history, and heredity have been identified as markers of risk for stroke. Although these factors can not be modified, their presence helps in identifying individuals at greatest risk of stroke, and those who may benefit from prevention or aggressive treatment of modifiable risk factors.

* Age: age is the single most important risk factor for stroke, for each successive 10 years after the age of 55, the stroke rate more than doubles in both men and women. The range of age in our stroke patients ranged from 16 to 90 years with mean of 57.74±12.9 and this age is in accordance with most of national studies, but the mean age in most western studies was higher than that in our study, it was 76.4 yrs and in another one (in U.K.) was 70.6 yrs and in a third one (in Germany) was 73 yrs. The lower mean age of stroke patients in our study and other Egyptian studies in comparison with western studies may be explained by the high number of population in older age group in western
countries and higher prevalence of rheumatic heart diseases reported in our study which are more common in younger age populations.

* Sex: stroke incidence was more in males 55.5% and females 44.5%, this result is in agreement with other studies9,18,24,44,45. Exceptions are in age <35 yrs where males were 36% and females were 64% p<0.05, these results are in agreement with most of other studies.24,26,46-50

Residence: Stroke patients from rural areas were more common than those from urban areas 57% vs 43%. Patients from rural areas carried a higher mortality rate than urban patients but with no statistical significant differences, also stroke subtypes are nearly the same as in the whole study, the higher incidence of stroke in rural areas can be explained logically by the relative deficiency of health care, consequently stroke risk factors were usually unchecked, neglected, or improperly managed.

Seasonal variations: Stroke incidence in autumn–winter reported to be 61.9% more than those occurring in spring–summer 38.1%, our results agree with most studies which reported that, both stroke incidence and mortality rates are higher in winter than summer51-53, on the other hand incidence of hemorrhagic stroke in summer is higher than that during winter 46.6% vs 31.8%.

Family history: Positive family history was reported in 9.6% of our patients with high predominance in males, 86.7% of those with positive family history were males and 13.3% were females (p<0.0001) also most of those with positive family history were with ischemic stroke 71% vs 29% with positive family history of hemorrhagic stroke, at least 35% of those hemorrhagic stroke patients with positive family history their CT and/or MRI reported large cortical, lobar and/or intraventricular hemorrhage with high possibilities of rupture of vascular malformations which usually have a heredofamilial (genetic inheritance) etiology33. Age of stroke patients with positive family history either ischemic or hemorrhagic was more predominant in age group < 40 years, also mortality rate is more in those patients with positive family history. Both maternal and paternal history of stroke was reported to be associated with increased stroke incidence, this increased incidence was explained by several mechanisms including genetic heredity of stroke risk factors, the inheritance of susceptibility to the effects of such risk factors, familial sharing of cultural, environmental and life style factors, and the interaction between genetic and environmental factors.35,54,55

Modifiable risk factors: Hypertension: hypertension reported in 42% of stroke patients ,more common in males 58.7% than females 41.3%, more predominant in those with hemorrhagic stroke (55%) p<0.00001 odds ratio 1.60.

Also hypertension was more common in age group > 40 years 43.8% compared with only 22.5% in those < 40 years O.R 3.7 with no difference regarding sex.

Our results are lower than that reported in some studies, e.g. in Ain shams study15 hypertension reported in 67% of stroke patients, in USA, NOMASS56 reported in 54.3% and in meta-analysis of eight national studies57 reported in 67.1%, while other studies reported lower rates of hypertension 31% and 32% (Sweden)12,58, while it was the same in another study (U.K)19.

Our results also agree with most of previous studies which reported hypertension to be more in hemorrhagic stroke.56-59

Hypertension is the single most important modifiable risk factor for stroke and is considered a major risk factor for both infarction and hemorrhage6,60. Most estimates for hypertension indicate a relative risk of stroke of approximately 4 when hypertension is defined as systolic $\geq$160 mmHg and/or diastolic $\geq$95 mmHg.61,62

Hypertension has the same effect on stroke mortality as on stroke incidence that it was reported in our as in other studies6,63,66, therefore measures that have been shown to control blood
pressure will reduce hypertension related stroke risk as well as fatal stroke and consequent disabilities.

**IHD:** reported in 32.8% of stroke patients of the study, reported more in males 55% than females 45%. IHD was reported in ischemic stroke 35% more than hemorrhagic strokes. 29% O.R. 1.6. IHD was reported in stroke patients Both males and females in age group ≥ 40 years (34.2%) significantly more than those in age group < 40 years (17.5%), while females in age group < 40 years were more affected than males. O.R. (3.5) in males and (2.1) in females. Our results are similar to other studies that reported IHD to be found in 32% (U.K)\(^{19}\) and 29.7\(^{77}\) of patients of those studies. On the other hand lower results than ours were reported in other studies where IHD reported to be found in 24.2\(^{68}\), 4.9\(^{69}\), 22\(^{58}\), NOMASS 26.3\(^{56}\). In national studies, the results were slightly higher than our results where in Ain Shams\(^{15}\) study it was 34% , in Egyptian meta-analysis of eight studies it was 42\(^{55}\).

**DM:** Case control studies of stroke patients and prospective epidemiological studies have confirmed an independent effect of DM on ischemic stroke, with an increased relative risk in diabetics ranging from 1.8 to nearly 6 folds\(^{70}\). DM was reported in 21.6% of stroke patients (Both ischemic & hemorrhagic) of this study. 56.4% of diabetic patients were presented with ischemic stroke while 43.6% were presented with hemorrhagic stroke with no sex difference. Diabetes was mainly predominant in age groups ≥ 40 years in both females and males (> 95%) O.R 3.8 (P→ sig.). Our results are significantly lower than other Egyptian studies, where in Ain Shams study\(^{15}\) DM reported in 44% of their stroke patients, in other national studies DM reported in 41% of stroke patients.\(^{59}\) And in 48% of another study.\(^{71}\) In meta-analysis of 7 older Egyptian studies\(^{52}\), diabetes reported in only 8.6% of patients. this discrepancy may be due to that in our study we included all stroke patients, hemorrhage and infarction while other studies reported mainly ischemic stroke in their studies. International studies reported incidence of DM around our results as, 17.3% (USA)\(^{56}\), in another study it was 25\(^{72}\) and 19.7% and 15.8% in further two studies\(^{73,74}\).

**Rheumatic heart diseases and valvular lesions:** reported in 5.6% of our patients, mainly with ischemic stroke 8.6% vs 0.6% in those with hemorrhagic stroke (P→ sig. O.R 16.3 with also male predominance 69% vs 31% in females, also rheumatic heart diseases were reported more in age group < 40 years (54%) with O.R (15.18) for males and (9.58) for females . These results agree with a previous study\(^{69}\) that found 4.2% of their stroke patients have rheumatic heart diseases, while in Benighazi Libya, incidence of rheumatic heart diseases reported to be in 16.3% of stroke patients.\(^{50}\)

**Atrial fibrillation:** reported in 6% of our patients, more in females 60% vs 40% in males, mainly in age group ≥ 40 years 82% O.R 3,19. 97.6% of those with AF were presented with ischemic stroke O.R 5.3 P→ sig. These results agree with that reported in Ain Shams, 7%\(^{15}\), and that of NOMASS, USA 5.7%\(^{56}\), otherwise our results are significantly lower than other international studies. e.g. 14.3\(^{67}\) in Tall Aviv, and 18.3\(^{19}\) in U.K

Atrial fibrillation is considered the most frequent potential cardiac source of embolism to the brain, in developed countries where rheumatic heart diseases are now rare, AF is usually non-rheumatic while in developing countries AF is usually rheumatic, and because ischemic AF is very closely related to age, most strokes associated with AF are in older age groups.\(^{75,76,77}\)

**Smoking:** Active cigarette smoking has been long recognized as a major risk factor for stroke with multifactorial pathophysiological effects including increased hematocrite, increased fibrinogen level, increased platelet aggregation, increased arterial wall stiffness and decreased high density lipoproteins\(^{78,79}\). Cigarette smoking increases risk of ischemic stroke nearly two times with clear dose – response relation.\(^{80}\) Cigarette smoking as a risk factor for subarachnoid hemorrhage is reported\(^{81}\), while in
intracerebral hemorrhage its risk is postulated by some hypotheses including elevation of proteolytic enzyme activity released by macrophages in the lung with liability for aneurysms formation and elevation of blood pressure with use of nicotine.\(^6\)

Smoking reported in 36.7% of our stroke patients predominant in males 84.3% than females 15.7%. P→ sig. 41% of the smoking patients were presented with hemorrhagic strokes compared with 59% presented with ischemic strokes.

Our results agree with other national studies, where in Ain shams study\(^15\) smoking reported in 33.3% of stroke patients, in Egyptian meta-analysis\(^57\) smoking reported in 36.1% and also in NOMASS\(^56\) smoking reported in 36.7% of stroke patients. Smoking as a risk factor for cerebral hemorrhage had been reported in a recent study with related risk of 2.15\(^82\).

**Hyperlipidemia:** It is well documented that increasing levels of total plasma cholesterol and low density lipoprotein cholesterol and decreasing level of high density lipoprotein cholesterol, are strong risk factors for coronary heart disease, while the relation between risk of blood lipids and stroke is much weaker\(^83,85\). However recent studies clarified the relationship between lipids and stroke, as well as showing that the risk of stroke and amount of carotid atheroma can be reduced with cholesterol lowering drugs\(^86-91\). On the other hand an inverse association between total cholesterol and cerebral hemorrhage had been reported\(^84,92\).

In the present study, hyperlipidemia reported in 29.5% of stroke patients, of the hyperlipidemic stroke patients 55%. Were presented with ischemic stroke and 45% presented with hemorrhagic stroke with no definite causal relationship with stroke subtypes can be defined.

Regarding incidence of hyperlipidemia in stroke in general, there is much discrepancy between different studies, where Ain Shams\(^7\) study reported incidence of 34.9% for dyslipidemia and in Egyptian meta-analysis three studies\(^57\) dyslipidemia was reported in 57.9%, western studies showed also much variations where, some studies reported higher results as 41%\(^58\), while others reported much lower results as 2.1%\(^69\), and 4.6%\(^19\).

**History of TIAs and/or History of previous stroke:**

TIAs reported in 23% of stroke patients, 89.8% of those patients with TIAs developed ischemic stroke and 11.2 % developed hemorrhagic stroke P→ sig, O.R 7.4. denoting that TIAs is an important predicting risk factor for ischemic stroke. 78% of patients who developed TIAs were in the age group ≥ 40 years and 22% < 40 years with equal presentation in both sexes.

History of previous stroke reported in 10.5% of our stroke patients, more in those with ischemic strokes, P→ sig, O.R.(10.72). Our results are around other national studies which reported history of previous similar attacks and /or TIAs in 33.2% of stroke patients\(^57\) also in NOMAS\(^56\), history of previous attacks reported in 21.5 % of patients, and in Ain Shams study\(^15\) incidence of 34.9 % was reported. History of recurrent strokes in our study was reported to be more in males 65% than females 35%, that is in agreement with previous study which reported history of recurrent strokes to be more in women than in men.\(^93\)

History of previous mild strokes and or TIAs is considered a significant independent risk factor for stroke even after adjustment for major vascular risk factors, the average risk for stroke in patients with TIA is about 4% and history of recent TIA has a higher risk for ischemic stroke than remote TIA\(^94,95\).

In NOMAS\(^56\), stroke recurrence was frequent with 25% suffering of recurrent stroke by 5 years, moreover, mortality after a recurrent stroke was greater than after the first stroke\(^56\).

**Alcoholics:**

Alcohol consumption was reported to be an independent and may be a causal risk factor for stroke through rising blood pressure\(^96,97\), affecting
blood lipids\textsuperscript{98} and causing atrial fibrillation and cardiomyopathy\textsuperscript{99}. The causal risk factor is more obviously for hemorrhagic strokes than ischemic strokes\textsuperscript{99,100}. In the present study we reported one of the lowest results comparing with other international studies, where we reported only 1.3\% of our stroke patients to be alcoholics, all of them were males ≤ 40 years 2/6 of them presented with ischemic stroke and 4/6 presented with hemorrhagic stroke. It was reported that increasing alcohol consumption increases risk for brain hemorrhage\textsuperscript{101}.

**Obesity:**

Obesity (defined as body mass index ≥30 Kg/m\textsuperscript{2} and overweight with body mass index ≥27 Kg/m\textsuperscript{2}) predisposes to cardiovascular diseases in general and to stroke in particular. Obesity is associated with increased, blood pressure, blood sugar and blood lipids. On these bases, it is not surprising that obesity would be related to an increased risk of stroke. It was reported that individuals with BMI > 27.8 Kg/m\textsuperscript{2} had a relative risk for ischemic strokes and hemorrhagic strokes of 1.84 and 1.93 respectively compared with individuals with BMI < 22 Kg/m\textsuperscript{2}\textsuperscript{102}. However, several large studies suggest abdominal obesity (pattern of obesity) rather than BMI or general obesity is more closely related to stroke risk\textsuperscript{102-104}.

In the present study, we reported obesity in 10.1\% of patients, more predominant in females 66\% and more in ischemic stroke 13.4\% than hemorrhagic stroke 4.6\%, odds ratio 3.22, P→ sig.

**Stresses:**

Acute triggers such as emotional stress are suggested to be associated with increased stroke risk through activation of the sympathetic system with consequent reduction of vagal tone which is protective for the heart, increasing blood pressure, increasing blood glucose and hemo-concentration.

In our study emotional stress was reported prior stroke event [hours] in 8.1\% of patients more in males 76.3\% than females 34.7\% with no significant difference regarding stroke subtypes.

**Oral contraceptive pills:**

The oral contraceptive pills used in the 1960s and 1970s with an estrogen content > 50 μg were strongly associated with increased stroke risk, about triple the risk of ischemic stroke, less for hemorrhagic strokes. Fortunately, the modern oral contraceptive pills, with progesterone only or with low estrogen content carry a lower or no increased stroke risk\textsuperscript{105}.

In our study 4.8\% of female stroke patients were on contraceptive pills, all of them were in age group < 40 years, more in the ischemic stroke group 53.3\% compared with 22.2\% in the hemorrhagic stroke group.

**Education:**

67.5\% of our stroke patients were non educated and only 32.5\% were educated P→ sig. In the non educated stroke patients 53.3\% were ischemic stroke and 46.7\% were hemorrhagic stroke, while in the educated group most of patients were ischemic stroke 81.6\% and only 18.4\% were hemorrhagic. Higher age specific group was reported more in the non educated group with more bad prognosis than the educated group.

**Outcome of our stroke patients:**

Mortality rate in our study after one month was 27.8\%, this rate is higher than that reported by many other western studies, where in Malmo, Sweden it was 15\%\textsuperscript{12} in the Oxford shire Community Stroke Project it was 19\%\textsuperscript{18} and in Umbario Italy, it was 20.3\%\textsuperscript{106} however some other studies reported similar results as in the U.K. it was 31\%\textsuperscript{19} and in Australian study it was 24\%\textsuperscript{58}. These variations may be explained by the followings, our study is a hospital based study which usually includes most of the severe stroke patients, the illiteracy of some of the populations who brought the patients after passage of the early important time after the insult and unavailability of stroke care unit in our hospital. Stroke mortality was more in hemorrhagic strokes 42.3\% vs 19.2\% in ischemic strokes.

Stroke patients with DM carried mortality rate of 34.7\%, followed by those with AF 32.1\%, hypertension 31.1\%, IHD 28.8\% and Rh.H.D 15.4\%, in stroke patients with two or more of the previous risk factors, the mortality rate reached more than 40\%. Mortality rate in our stroke patients > 40 years was 29\% and in patients < 40 years 17.5\%. Our results agree with other studies\textsuperscript{107,108}. Mortality of male stroke patients was 30.5\% higher than
females 24.5% in all age groups, also these results agree with others\textsuperscript{109,110}.

**Conclusion and recommendations:**

In southern Egypt stroke study, we reported the followings. Higher incidence of haemorrhagic strokes. Lower age of stroke onset. Overall male predominance except in age <35 years with female predominance. Predominance of patients from Rural areas with more incidence of haemorrhage and more bad prognosis. More stroke incidence in winter with higher incidence of haemorrhage in summer. Positive family history reported more in males, more in ischaemic strokes, more in age < 40 years with more bad prognosis. Male predominance of hypertension, more in ischaemic strokes, more in age > 40 y. Male predominance of IHD, more in ischemic strokes and more in age > 40 y. Male predominance of smoking, more in ischemic strokes. D.M reported more in age > 40 y, more with ischemic strokes. Rh.H.D. reported more In males, more with ischemic strokes and more in age < 40 y.

A.F reported more in ischemic strokes. D.M reported more in age > 40 y. Obesity reported more in females and more in ischemic strokes. Emotional stresses prior stroke insult reported more in males. Mortality rate was higher in, hemorrhagic strokes, males, > 40 y, recurrent strokes, and in those with positive family history.

Table 1. Distribution of stroke cases in Southern Egypt by demographic differentials.

<table>
<thead>
<tr>
<th>Item</th>
<th>Infarction N = 292 (62.5%)</th>
<th>Hemorrhage N = 175 (37.5%)</th>
<th>Total N = 467 (100%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>Sex:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---Male</td>
<td>161</td>
<td>55.1</td>
<td>98</td>
</tr>
<tr>
<td>-- &lt; 40 y.</td>
<td>11</td>
<td>6.8</td>
<td>5</td>
</tr>
<tr>
<td>-- &gt; 40 y.</td>
<td>150</td>
<td>93.2</td>
<td>93</td>
</tr>
<tr>
<td>---Female</td>
<td>131</td>
<td>44.9</td>
<td>77</td>
</tr>
<tr>
<td>-- &lt; 40 y.</td>
<td>15</td>
<td>11.5</td>
<td>9</td>
</tr>
<tr>
<td>-- &gt; 40 y.</td>
<td>116</td>
<td>88.5</td>
<td>68</td>
</tr>
<tr>
<td>P** value</td>
<td>NS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age at enrollment*:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---&lt; 40 years</td>
<td>26</td>
<td>8.9</td>
<td>14</td>
</tr>
<tr>
<td>---40 – 60</td>
<td>106</td>
<td>36.3</td>
<td>58</td>
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<tr>
<td>---&gt; 60 years</td>
<td>160</td>
<td>54.8</td>
<td>103</td>
</tr>
<tr>
<td>P value</td>
<td>NS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residence:</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>---Rural</td>
<td>164</td>
<td>56.2</td>
<td>107</td>
</tr>
<tr>
<td>---Urban</td>
<td>128</td>
<td>43.8</td>
<td>68</td>
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<tr>
<td>P value</td>
<td>NS</td>
<td></td>
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<tr>
<td>Education:</td>
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<tr>
<td>---Educated</td>
<td>124</td>
<td>42.5</td>
<td>28</td>
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<tr>
<td>---Non-educated</td>
<td>168</td>
<td>57.5</td>
<td>147</td>
</tr>
<tr>
<td>P value</td>
<td>&lt;0.001</td>
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<tr>
<td>Seasonal variation:</td>
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<tr>
<td>---Aut.-winter</td>
<td>197</td>
<td>67.5</td>
<td>92</td>
</tr>
<tr>
<td>---Spr.-summer</td>
<td>95</td>
<td>32.5</td>
<td>83</td>
</tr>
<tr>
<td>P value</td>
<td>0.001</td>
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</tbody>
</table>

*NS = insignificant statistical difference. P* = statistical difference between sub-items, P** = statistical difference between items.
Mean age at enrollment = [57.7 + 12.9] years, the median = 60 years, the infarction started at 16 years old while the hemorrhage started at 21 years of age.

Table 2. Distribution of Stroke in Southern Egypt according to gender.

<table>
<thead>
<tr>
<th>Item</th>
<th>Total No. of Cases (%)</th>
<th>Male (n = 259)</th>
<th>Female (n = 208)</th>
<th>P</th>
</tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td>No. of cases</td>
<td>No. of cases</td>
<td></td>
</tr>
<tr>
<td>Sociodemographic differentials</td>
<td></td>
<td>Row %</td>
<td>Row %</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>--Educated</td>
<td>152 (32.5%)</td>
<td>138</td>
<td>14</td>
<td>9.2</td>
</tr>
<tr>
<td>--Non-educated</td>
<td>315 (67.5%)</td>
<td>264</td>
<td>51</td>
<td>16.2</td>
</tr>
<tr>
<td>+ve family history</td>
<td>45 (9.6%)</td>
<td>39</td>
<td>6</td>
<td>13.3</td>
</tr>
<tr>
<td>Previous attack</td>
<td>49 (10.5%)</td>
<td>32</td>
<td>17</td>
<td>34.7</td>
</tr>
<tr>
<td>Stress</td>
<td>38. (8.1%)</td>
<td>29</td>
<td>9</td>
<td>23.7</td>
</tr>
<tr>
<td>Obesity+</td>
<td>47 (10.1%)</td>
<td>16</td>
<td>31</td>
<td>65.9</td>
</tr>
<tr>
<td>Smoking</td>
<td>171 (36.7%)</td>
<td>110</td>
<td>61</td>
<td>15.7</td>
</tr>
<tr>
<td>Alcohol cons.</td>
<td>6 (1.3%)</td>
<td>6</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Associated risk factor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypertension</td>
<td>196 (41.9%)</td>
<td>115</td>
<td>81</td>
<td>41.3</td>
</tr>
<tr>
<td>Ischemic H.D.</td>
<td>153 (32.7%)</td>
<td>84</td>
<td>68</td>
<td>45.1</td>
</tr>
<tr>
<td>Atrial fibril.</td>
<td>28 (5.9%)</td>
<td>11</td>
<td>17</td>
<td>60.7</td>
</tr>
<tr>
<td>Diabetes M.</td>
<td>101 (21.6%)</td>
<td>50</td>
<td>51</td>
<td>50.5</td>
</tr>
<tr>
<td>Rheumatic H.</td>
<td>26 (5.6%)</td>
<td>8</td>
<td>18</td>
<td>69.2</td>
</tr>
<tr>
<td>Outcome of the cases at discharge from the hospital</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improvement</td>
<td>337 (72.2%)</td>
<td>180</td>
<td>157</td>
<td>46.6</td>
</tr>
<tr>
<td>Death</td>
<td>130 (27.8%)</td>
<td>79</td>
<td>51</td>
<td>39.2</td>
</tr>
</tbody>
</table>

*P = NS, there were no statistically significant difference between stroked males and females as regard the the specified factor. **Mean age of M (59.4 + 12.2) was > that of F (55.6 + 13.6) years. + Obesity = body mass index (weight, kg / height, m2) > 30

Table 3. Age and risk factors in development of Stroke (467 cases) in Southern Egypt.

<table>
<thead>
<tr>
<th>Item No. (column %)</th>
<th>Risk factors</th>
<th>DM</th>
<th>Hypertension</th>
<th>IHD</th>
<th>AF</th>
<th>RHD</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>- ve</td>
<td>- ve</td>
<td>- ve</td>
<td>- ve</td>
<td>- ve</td>
<td>- ve</td>
</tr>
<tr>
<td>&lt; 40 years</td>
<td></td>
<td>39</td>
<td>1</td>
<td>31</td>
<td>9</td>
<td>33</td>
<td>7</td>
</tr>
<tr>
<td>&gt; 40 years</td>
<td></td>
<td>327</td>
<td>100</td>
<td>240</td>
<td>187</td>
<td>281</td>
<td>146</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>366</td>
<td>101</td>
<td>271</td>
<td>196</td>
<td>314</td>
<td>153</td>
</tr>
<tr>
<td>% from total</td>
<td></td>
<td>78.4</td>
<td>21.6</td>
<td>58.0</td>
<td>42.0</td>
<td>67.2</td>
<td>32.8</td>
</tr>
<tr>
<td>Odds Ratio*</td>
<td></td>
<td>11.9</td>
<td>2.7</td>
<td>2.45</td>
<td>0.4</td>
<td>0.05</td>
<td>0.52</td>
</tr>
<tr>
<td>Risk limits</td>
<td></td>
<td>1.7-236.5</td>
<td>1.2-6.2</td>
<td>1.0-6.2</td>
<td>0.1-1.3</td>
<td>0.02-0.14</td>
<td>0.21-1.28</td>
</tr>
</tbody>
</table>
Table 4. Risk factors in development of either infarction or hemorrhage in stroke cases in Southern Egypt.

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Risk factors</th>
<th>Obesity</th>
<th>Stresses</th>
<th>Smoking</th>
<th># C.O. Contraceptives</th>
<th>Alcoholics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>- ve</td>
<td>+ ve</td>
<td>- ve</td>
<td>+ ve</td>
<td>- ve</td>
</tr>
</tbody>
</table>
| Hemorrhage |              | 167     | 8        | 161     | 14                   | 105        | 70   | 75   | 2
| Infarction |              | 253     | 39       | 268     | 24                   | 191        | 101  | 123  | 8
| Total     |              | 420     | 47       | 429     | 38                   | 296        | 171  | 198  | 10 |
| Column %  |              | 89.9    | 10.1     | 91.9    | 8.1                  | 63.4       | 36.6 | 84.6 | 15.4 |
| Odds Ratio* |              | 3.22    | 1.03     | 0.77    | 0.41                 | 0.41       | 0.52 | 1.20 |
| Risk limits |              | 1.40 – 2.17 | 0.49 – 2.17 | 0.67 – 1.08 | 0.06 – 2.16 | 0.19 – 9.53 |
| P value   |              | 0.0022  | 0.93     | 0.18    | 0.25                 | 0.833      |

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Risk factors</th>
<th>DM</th>
<th>Hypertension</th>
<th>IHD</th>
<th>AF</th>
<th>RH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>- ve</td>
<td>+ ve</td>
<td>- ve</td>
<td>+ ve</td>
<td>- ve</td>
</tr>
</tbody>
</table>
| Hemorrhage |              | 131  | 44     | 79   | 96  | 124 | 51   | 172  | 3
| Infarction |              | 235  | 57     | 192  | 100 | 190 | 102  | 267  | 25 |
| Total     |              | 336  | 101    | 271  | 196 | 314 | 153  | 439  | 28 |
| column %  |              | 78.4 | 21.6   | 58%  | 42% | 67.2| 32.8 | 94%  | 6% |
| Odds Ratio* |              | 1.2  | 1.60   | 1.30 | 1.97 | 1.30 | 1.95 | 5.3  | 16.29 |
| Risk limits |              | 0.91 – 1.80 | 1.30 – 1.97 | 0.87 – 1.95 | 1.59 – 18.05 | 2.18 – 121.33 |
| P value   |              | 0.15 | 0.0001 | 0.19  | 0.00025 | 0.00027 |

### Graphical Representation

![Graph showing comparison of risks across different studies](image-url)

264
Fig. (1): Incidence of stroke and stroke subtypes (comparative).

REFERENCES


