# Ischemic Versus Hemorrhagic Stroke in Patients with First Ever Stroke in Sohag: Risk Factors, Presentations, and Stroke Severity.

Hassan M. El Nady, MD; Mohammed A Abbas, MD; Hazem K Hewag, MD; Alameer B Mohammed; Msc. Department of neurology, Sohag University

## <u>Abstract</u>

**Background and Purpose:** Patients with ischemic (IS) and hemorrhagic strokes (HS) in Sohag were compared to reveal possible differences regarding risk factors, presentations, stroke severity, laboratory and radiological findings.

**Methods:** Hospital-based, retrospective study including 358 patients diagnosed with first ever stroke by clinical and imaging tools, aged  $\geq$ 45 years. Basic demographic information was recorded. All the patients were subjected to complete history, neurological and medical evaluation and laboratory investigations for identification of symptoms of stroke and to detect stroke risk factors. Stroke severity was determined using the Glasgow Coma Scale (GCS) and NIHSS.

**Results:** Our study has shown that age of first-ever stroke is significantly higher in IS than in HS and smoking among males favor IS rather than HS. Hypertension favored HS than IS, especially in those with hypertension firstly discovered with the onset of stroke, however hypertensive patients who were not compliant for antihypertensive therapy are more risky to develop IS. The present study has shown that, sex, DM, hyperlipidemia, IHD, AF, drug abuse and family history of stroke did not herald stroke type. Sensory deficits are more frequently elicited in patients with IS, vomiting and hiccough in HS. Strokes are more severe in patients with HS (determined by GCS and NIHSS). Also, we have found that patients with HS have lower serum sodium and more enhanced haemostatic function. Among the radiological data we have found that the presence of leukoaraiosis and bilateral lesions in the brain CT favored IS rather than HS.

**Conclusion:** certain differences are found between ischemic and hemorrhagic strokes regarding the clinical presentation, stroke severity, risk factors and laboratory findings, this may help to differentiate between both types of stroke till the imaging tools and radiological data are available. Particular factors can be considered as pointers for serious events that could predict patients at high-risk for developing either types of stroke.

## Introduction

Understanding the relative role of risk factors in hemorrhagic stroke (HS) versus ischemic stroke (IS) is still conflicting1. A number of risk factors are common for both HS and IS2–4. The correlation of atrial fibrillation, diabetes and ischemic heart disease with IS seems well-recognized in comparative studies, nevertheless the relative role of risk factors such as hypertension, smoking, and alcohol consumption remains divisive2–8. Early detection of intracranial blood is essential for the rational use of antihemostatic drugs in stroke patients. Clinical differentiation of stroke types often challenging even is for experienced physicians, and the computed tomographic (CT) scan has now become the main component of the diagnosis9-11. In areas with limited brain imaging facilities, scoring models have been proposed to clinically distinguish hemorrhage from infarction12,13. Strokes are in the main more grave in patients with HS, and the proportion between HS and IS is intimately related to stroke severity 8. Based on this knowledge, we studied differences between patients with IS and HS with respect to risk factors, presentations, stroke severity, laboratory and radiological findings.

## Materials and Methods:

From October 2010 to March 2011, 406 patients with stroke were admitted to the neurology department of the Sohag university hospital. Patients with age below 45 years, those with recurrent stroke, traumatic brain hemorrhage, cerebral hemorrhage on top of cerebral neoplasm, subarachnoid hemorrhage and those on oral anticoagulant were excluded. The remaining 358 patients with first ever stroke separated by stroke type were retrospectively analyzed. The diagnosis was ischemic stroke in 234 patients and was hemorrhagic stroke in 124 patients.

The following data were collected: gender, smoking, age, hypertension, hypercholesterolemia, diabetes mellitus, history of cardiac disease including rheumatic heart disease. myocardial infarction. coronary artery disease, heart failure, atrial fibrillation and positive family history for cerebrovascular stroke. The subjects were considered to be

hypertensive if their blood pressure readings preceding the index stroke had repeatedly exceeded 140/95 mm Hg. or if they were taking antihypertensive medication, the patients were recorded as having diabetes mellitus if they used oral hypoglycemic agents or insulin, and as having cardiac disease when known before admission or diagnosed on admission. Clinical data on admission were collected including: systolic and diastolic blood pressure, admission temperature, pulse rate and its rhythm. the presence of hiccough or vomiting, side of weakness, the presence of aphasia among non-comatosed patients, severity of stroke using the Glasgow Coma Scale (GCS) and NIHSS and the presence of fits either focal or generalized. The following laboratory data were evaluated: blood sugar, serum creatinine, complete blood count, coagulation profile, erythrocyte sedimentation rate, serum electrolytes and liver function tests. Regarding the radiological data, the following were considered: bilateral lesions, and the presence of leukoaraiosis.

### **Statistics**

Categorical variables were compared by chi-square test or Fisher exact 2-tailed test as appropriate. Continuous variables were compared between the groups by Student t test.

# <u>Results</u>

Tow hundreds thirty four (65.3%) patients had IS whereas 124 (34.6%) had HS.

### **Risk factors**

Table 1 summarizes the chief characteristics of the population studied. The age of patients with IS was significantly higher than those with HS (p=0.017). Patients with IS were more often non-compliant for antihypertensive therapy (p=0.005) and were more often smokers (p=0.015). Patients with HS were more often hypertensive (p=0.000), and the discovery of hypertension for the first time on admission favored HS rather than IS (p=0.001). No difference in sex, prevalence of diabetes mellitus, cardiac disease, drug abuse was found between patients with IS and HS.

#### Clinical data and stroke severity

Table 2 shows the main clinical differences and severity difference between patients with IS and those with HS. Sensory deficits were more likely to be elicited in patients with IS rather than HS (P=0.003). Patients with HS were more often presented with coma (p=0.000), hiccough (p=0.021), vomiting (p=0.000), and higher blood pressure on admission (p=0.000). No difference as regard the presence of motor deficit, aphasic disorder, fits, admission temperature, and pulse rate was found between patients with IS and HS. Regarding stroke severity, patients with HS had more severe strokes (p=0.000)

#### Laboratory and radiological findings

Table 3 shows the main laboratory and radiological differences between patients with IS and those with HS. Patients with HS more often had lower serum sodium, lower prothrombin time and higher prothrombin concentration and on the other hand patients with IS more often had bilateral lesions in brain CT and leukoaraiosis

#### Table1: Risk factors according to stroke subtypes.

	Ischemic	Hemorrhagic	p-
	stroke	stroke	value
	(n=234)	(n=124)	
Male sex %	116 (49.5%)	67 (54.03%)	0.422
Age; M(SD)	$64.07 \pm 10.8$	$61.32 \pm 9.1$	0.017
Smoking among males	67 (57.7%)	26 (38.8%)	0.015
Hypertension	152 (64.9%)	114 (91.9%)	0.0000
Hypertension firstly discovered	52 (22.2%)	62 (50%)	0.001
Non-compliant patients for antihypertensive	81(52.2%)	39 (32.5%)	0.005
therapy			
DM	89 (38%)	40 (32.2%)	0.299
Hyperlipidaemia	89 (38%)	38 (30.6%)	0.202
IHD	62 (26.4%)	23 (18.5%)	0.117
AF	36 (15.3%)	13 (10.4%)	0.492
Drug abuse	11 (4.7%)	4 (3.2%)	0.591
Family history	1 (0.4%)	1(0.8%)	1.000

### **Table2:** clinical data and stroke severity according to stroke subtypes

	Ischemic	stroke	Hemorrhagic	stroke	p-value
	(n=234)		(n=124)		
Motor deficit	205 (87.6%)		116 (93.5%)		0.1
Sensory deficit	35 (14.9%)		4 (3.2%)		0.003
Aphasic disorder	42 (21.4%)		20 (22.9%)		0.758
Fits					
Focal	8 (3.4%)		2 (1.6%)		
Generalized	3 (1.2%)		0 (0%)		0.268
Coma (GCS≤8)	8 (3.4%)		21 (16.9%)		0.0000
Hiccough	41 (17.5%)		35 (28.2%)		0.021
Vomiting	22 (9.4%)		44 (35.5%)		0.000
Systolic blood pressure	$152.2 \pm 30.4$		$174.9 \pm 30.2$		0.000
Diastolic blood pressure	$89.02 \pm 12.1$		95.8 ±13.3		0.000
Admission temperature	$37.3 \pm 0.3$		37.3 ±0.3		0.768
Pulse rate	82.6±6.4		81.9 ±7.5		0.333
GCS	13.06±2.7		11.37±3.8		0.000

NIHSS	$8.82 \pm 3.6$	1	0.95±3.8		0.000		
Table3: Laboratory and radiological findings according to stroke subtypes							
	Ischemic	stroke	Hemorrhagic	stroke	p-value		
	(n=234)		(n=124)				
Blood sugar	$195.4 \pm 106.2$		192.6±109.5		0.8		
Serum creatinine	$1.08 \pm 0.9$		1.1±0.5		0.8		
RBCs	4.17±0.5		4.3±0.6		0.8		
WBCs	$10.95 \pm 4.0$		$11.52 \pm 3.8$		0.199		
Platelet	292.15±80.9		286.19±78.7		0.504		
PTT	34.34±7.6		33.64±6.1		0.378		
Prothrombin time	12.61±1.6		12.21±1.9		0.043		
Prothrombin concentration	90.82±14.0		95.70±12.6		0.001		
ESR 1 <sup>st</sup> hour	23.65±15.0		21.94±12.6		0.283		
ESR 2 <sup>nd</sup> hour	49.34±24.9		46.23±22.2		0.244		
Na <sup>+</sup>	139.36±5.7		137.15±6.2		0.001		
K <sup>+</sup>	$4.098 \pm 0.5$		4.197±0.7		0.153		
Ca <sup>+</sup>	$9.078 \pm 0.5$		8.976±0.7		0.147		
AST	35.71±43.1		32.93±29.8		0.523		
ALT	$34.44 \pm 38.8$		35.90±41.3		0.740		
Radiological Findings							
Bilateral lesions	31 (13.2%)		0 (0%)		0.000		
Leukoaraiosis	105 (44.8%)		17 (13.7%)		0.000		

## **Discussion**

Both hospital based and population based studies carry a lot of controversy regarding the risk factors that favor hemorrhagic vs ischemic strokes. Regarding hospital based studies, diabetes and ischemic heart disease favored IS, whereas age, hypertension, alcohol consumption, atrial fibrillation, and smoking were not predictors of stroke type in one study8, however; in another study7, smoking, hypercholesterolemia, migraine, previous transient ischemic attack, atrial fibrillation, and heart favored disease IS. whereas hypertension was the only significant factor related to HS vs IS. In one population based study, patients with hypertension and diabetes are more risky to develop IS and patients with high alcohol intake favored HS, whereas smoking did not favor either of the stroke subtypes5. In another study, patients with IS are more likely to have higher age, previous stroke, and diabetes, whereas ischemic heart

disease. atrial fibrillation, hypertension. alcohol intake and smoking did not favor either of the stroke subtypes6. Recently, diabetes, atrial fibrillation, previous myocardial previous infarction, stroke. and intermittent arterial claudication were associated with IS rather than HS, smoking and high alcohol intake favored HS, whereas age, sex, and hypertension did not herald stroke type1.

### **Risk factors**

Our study shows some stroke type differences in patients suffering first-ever acute stroke. First, age of first-ever stroke is significantly higher in IS than in HS. This finding has been documented previously6,14. It is extremely rare to find a smoking woman in our locality, so we have found that it is better to study smoking among males. Our study has shown that, smoking among males favor IS rather than HS. Controversy surrounding smoking regard as

favoring HS1 or neither of stroke subtypes6,8. unique findings Our depending differentiation on sex avoided the presence of possible biological interaction between gender type and the risk of smoking. Again we have addressed some new interesting regarding hypertension. facts In agreement with previous studies7, hypertension in general favored HS than IS, especially in those with hypertension firstly discovered with the onset of stroke, however hypertensive patients who were not compliant for antihypertensive therapy are more risky to develop IS rather than HS. This means that just the discovery of hypertension even with non perfect management is protective against HS but still a risk factor for IS. The present study has shown that, sex, DM, hyperlipidaemia, IHD, AF, drug abuse and family history of stroke did not herald stroke type.

### Clinical data and stroke severity

In our study we have found that sensory deficits are more frequently elicited in patients with IS, this finding is in disagreement with a previous study 15. The source of disagreement is mostly secondary to the fact that higher percentage of HS patients has a disturbed consciousness in whom sensory deficit could not be elicited. In agreement with previous studies16-18, vomiting, a well- recognized ICHrelated symptom due to increased intracranial tension and meningism resulting from blood inside the ventricles, favored HS rather than IS. Hiccough was more frequently reported in HS patients than in IS patients. This is a new finding, as previously, hiccoughs were mentioned in relation to certain ischemic lesion locations19.20. In our study we have used GCS and NIHSS to determine the

stroke severity. Strokes are usually more severe in patients with HS, and the proportion between HS and IS is intimately related to stroke severity8. The same was found in our study as more severe stroke favored HS rather than IS. We have found no difference between HS and IS as regard motor deficit, aphasic disorder, fits either focal or generalized and admission temperature.

### Laboratory and radiological findings

Among the laboratory data, we have found that patients with HS have shortened prothrombin time and higher prothrombin concentration than those with IS, putting in mind that we excluded patients with coagulation receiving disorders and those anticoagulant therapy, this finding may denote that intracerebral hemorrhage enhanced initiate а state of coagulability to guard against hematoma expansion. The same was found in a study concerning the association between hemostatic systems and ICH21, the study reported thrombin-antithrombin that the complex values significantly increased with an increase in hematoma size and that patients with an inadequate rise of the thrombin-antithrombin complex values had a high risk of hematoma enlargement. Also, we have found that patients with HS have lower serum sodium than those with IS, however this may be related to the fact that laboratory tests usually done within the first 24 hours, during this period patients with HS have received at least 2-3 doses of dehydrating drugs (e.g. manitol) which are mostly the cause of this difference. Among the radiological data we have found that the presence of leukoaraiosis and bilateral lesions in the brain CT favored IS rather than HS.

## Conclusion:

Certain differences are foun between ischemic and hemorrhagic strokes regarding the clinical presentation, stroke severity, risk factors and laboratory findings, this may help to differentiate between both types of stroke till the imaging tools

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and radiological data are available at hands. Particular factors can be considered as pointers for serious events that could predict patients at high-risk for developing either types of stroke.

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الملخص العربى

# مقارنة حالات السكتة الدماغية الارتوائية و السكتة الدماغية الناتجة عن نزيف المخ في مرضى السكتة الدماغية وحيدة الحدوث، في سو هاج: عوامل الخطورة و الاعراض وشدة السكتة الدماغية

هناك العديد من الاختلافات حول عوامل الخطورة التي تؤدى الى السكتة الدماغية الارتوائية و السكتة الدماغية الناتجة عن نزيف المخ، حيث يوجد عوامل خطورة مشتركة بين الحالتين. كما يوجد عوامل خطورة ذات ارتباط وثيق بالسكتة الدماغية الارتوائية. ولكن الدور النسبى لعوامل الخطورة مثل ارتفاع ضغط الدم و التدخين و الكحوليات لا يزال يخمل الكثير من الاختلاف. من جانب اخر غالبا ما تكون السكتة الدماغية الناتجة عن نزيف المخ اكثر شدة من السكتة الدماغية الارتوائية. كان الهدف من هذا البحث هو تحديد العوامل التي تؤدى الى اى النوعين من السكتة الدماغية وتوضيح شدة السكتة الدماغية فى كلا النوعين. تتكون هذه الدراسة من تحليل بيانات ٥٨ مريض سكتة دماغية وتوضيح شدة السكتة الدماغية فى كلا النوعين. تتكون هذه الدراسة من بواسطة الاشعة المقطعية. وقد خضع كل المرضى لفحص اكلينيكي و عصبى كامل يشمل اخذ التاريخ المرضى واشعة مقطعية و فحوصات معملية كاملة و تم تحديد شدة السكتة الدماغية باستخدام مقياس السكتة الدماغية الخاص بالمعهد القومي. و قد وضع كل المرضى لفحص اكلينيكي و عصبى كامل يشمل اخذ التاريخ المرضى الخاص بالمعهد القومي. و قد المحنت هذه الدراسة المرضى المصابين بالسكتة الدماغية الاماغية معرا و ذوى معدل تدخين اعلى و لوحظ انهم غير منتظمين فى تناول ادوية الماغية و يعانون من اعراض حسية الخاص بالمعهد القومي. و قد المحت هذه الدراسة المرضى المصابين بالسكتة الدماغية الاماغية معرا و ذوى معدل تدخين اعلى و لوحظ انهم غير منتظمين فى تناول ادوية المامي في اعراض حسية عمرا و ذوى معدل المرضى المصابين بالسكتة الدماغية ما لاكبر معرا الغاب الاخر المرضى المصابين بالسكتة الدماغية الامانية الماغية الدام عيان الماخ. المرغ و الاشعات المقطعية لهؤلاء المرضى يظهر بها هالات بيضاء اكثر كما يظهر بها اصابة فى جانبين المخ. على الجاب الاخر المرضى المصابين بالسكتة الدماغية كما يعانون اذين ما رائم فى الرغو