

Presentation and CT Scan Findings in Patients with Acute Stroke in Emergency Unit

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Abstract

Background: Cerebrovascular disease is one of the leading causes of death in the world. Distinction between cerebral infarction and intracerebral hemorrhage is crucial because nowadays proper management of the acute stroke syndrome is based on the appropriate diagnosis of the pathological type; as this will affect morbidity and mortality apart from prognosis; which is achieved by CT. This study was designed to show the characteristics of the problem of diseased patients with acute stroke in the emergency ward of Baghdad Teaching Hospital, Medical city, Iraq.

Aim of Study: To study the ways of the clinical presentation of patients with acute stroke by CT scan, the types of stroke and to evaluate the correlation of the clinical findings in relation to the type of stroke.

Patients and Methods: A prospective study was conducted from February 2011 to October 2011, including 110 patients with acute stroke presented to emergency ward of Baghdad Teaching Hospital, Medical City; as soon as their arrival CT scan of the brain was done for them and demographic details of clinical history and general, physical, cardiovascular and neurological examinations were carried out on the patients and recorded on a proforma specially designed for that purpose.

Results and Discussion: It was found that the incidence of ischemic infarction (83.6%), intracerebral hemorrhage (13.6%) and subarachnoid hemorrhage (2.7%) among 110 positive cases ($p = 0.0001$) from the total 120 patients examined. The highest age group affected was sixty years old and above ($P = 0.0001$). The commonest presentation of ischemic infarction and intra cerebral hemorrhage was the presence of focal neurological deficit which was at (78.2%), (60%) respectively. Severe sudden onset headache was the most common presentation in subarachnoid hemorrhage (100%) ($P = 0.0001$). The incidence of hypertension was the highest risk factor for the examined 110 patients with positive CT findings to be present at (55.45%), followed by diabetes mellitus to be present at (30.9). Thirty percent of the total patients were smokers and (19.5%) with history of ischemic heart disease. The commonest site of the brain involved by ischemic infarction was parietal lobe (56.5%), while the left hemisphere was the most side involved (60%).

Conclusion: The study showed a similar incidence pattern of stroke to other selected studies of different countries. Cerebral hemorrhage is more common in hypertensive stroke patients. Hypertension is most common modifiable risk factor for stroke in our country. Stroke should be suspected in young adults, and early imaging is required to save the patients' life.

Keywords: CT Scan; Acute Stroke; Emergency Unit

Abbreviations

ACA: Anterior Cerebral Artery; IHD: Ischemic Heart Disease; DM: Diabetes Mellitus; ICH: Intracerebral Hemorrhage; PC: Posterior Circulation (Vertebro Basilar System); Isch.I: Ischemic Infarction; PCA: Posterior Cerebral Artery; MCA: Middle Cerebral Artery; SAH: Subarachnoid Hemorrhage; MI: Myocardial Infarction; y: Years

Introduction

Cerebrovascular disease is one of the three leading causes of death in the world along with heart disease and cancer according to 2007 medical reports [1,2]. Becoming the fourth after lower respiratory tract infection in 2009 [3,4]. Distinction between cerebral infarction (Isch.I) and intracerebral hemorrhage (ICH) is important because nowadays proper management of the acute stroke syndrome is based on the correct diagnosis of the pathological type as this will affect morbidity and mortality apart from prognosis [1].

Computed tomography is an accurate, safe and noninvasive procedure for differentiating between cerebral hemorrhage and infarction. It also shows the correct site of lesion [1].

CT remains the most important investigation in patient suspected to have a stroke, as it is the most accurate and earliest imaging technique to demonstrate intracerebral and subarachnoid hemorrhages because of the clear distinction between high attenuation of extravasated blood and that of the surrounding brain [5,6]. Thus, hyperdense area on CT scan is due to an increased attenuation, which is addressed to the high electron density of the protein in hemoglobin. Initially the increased attenuation is 80 to 86 Hounsfield units (HU) [7]. The attenuation of whole blood with a hematocrit of 45% is approximately 56 Hounsfield units. Normal gray matter ranges from 37 to 41 HU and normal white matter from 30 to 34 HU, in which hypo dense areas are identified below this range. Thus freshly extravasated blood in a patient with a normal hematocrit can immediately be demonstrated on CT [8].

Stroke signifies an acute impairment of brain function caused by a variety of pathologic changes involving focal or multifocal intracranial or extra cranial blood vessels [6].

About 80% of all strokes are caused by too little blood flow (ischemic stroke), and the remaining 20% are nearly equally divided between hemorrhage into brain tissue (parenchymal hemorrhage) or the surrounding subarachnoid space (subarachnoid hemorrhage (SAH)) [9].

The internal carotid and vertebral arteries are the supplying arteries for the brain. Each internal carotid artery gives off two major branches which are the anterior cerebral artery (ACA) and the middle cerebral artery (MCA). The two vertebral arteries ascend on the anterolateral aspect of the medulla, at the lower border of pons they unite to form the basilar artery which lies in the midline ventral to the pons, at the upper border of the pons it bifurcate into two posterior cerebral arteries (PCA). The internal carotid and vertebrobasilar systems (PC) are connected by the posterior communicating arteries. The two (ACA) are connected by the anterior communicating arteries. As a result of these anastomosis, an arterial ring, the circle of Willis, is formed in relation to the base of the brain [10].

The severity of cerebral ischemia is defined by the degree and duration of blood flow deficiency which determines whether the brain suffers only temporary dysfunction or permanent damage (cerebral infarction).

There are three stages in the evolution of an ischemic stroke as depicted on CT as follows:

1. Acute ischemic changes occur within 24 hours and may be visible within three hours of the onset of stroke. These early ischemic changes are due to cytotoxic edema that accumulates intracellularly.
2. Subacute changes occur after 24 hours and reach peak in 3 to 5 days, and gradually subside over 1 to 4 weeks. They are due to vasogenic edema from leaky capillaries causing interstitial edema.

3. Chronic changes evolve over 3 to 6 weeks and eventually become permanent [11].

In an earlier nomenclature, early ischemic changes were not recognized and the first CT signs identified were those developing after 24 hours. These were termed “acute” (now termed “subacute”). When early ischemic changes were later recognized, they were termed “hyperacute” (i.e. occurring within 24 hours (now termed “acute”). This older terminology appears sometimes in radiologists’ reports (e.g. the changes seen within the first 24 hours are referred to as “hyperacute”). Ischemic changes are localized to the territory of the involved vessel as seen in figure 1 showing the stages of an MCA. Infarction and its evolutionary changes in brain tissue picture [8,11].

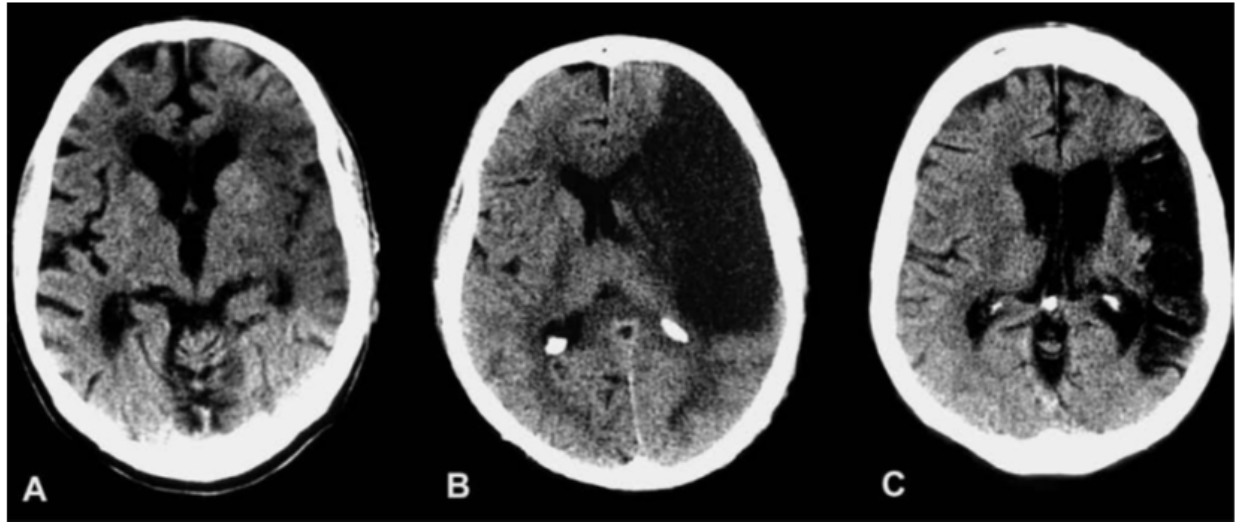


Figure 1: Evolution of a large left MCA stroke.

(A) Acute (< 24 hours)-Cytotoxic edema causes slightly decreased attenuation, loss of the normal gray/white interface, and effacement of the cortical sulci (slight mass effect).

(B) Sub acute (2 - 7 days)-Vasogenic edema in a well-demarcated wedge-shaped region of low attenuation. Considerable mass effect causes midline shift.

(C) Chronic (months to years)-Infarct has very low attenuation (similar to CSF); diminished volume causes expansion of the adjacent lateral ventricle (“negative mass effect”) [8,11].

Hemorrhagic transformation of ischemic infarction is defined as an area of low attenuation conforming to a vascular territory within which a single non-homogenous area or multiple areas of high attenuation are present with characteristic blood density [12].

Thrombotic and occlusive venous disease can cause infarction due to obstruction of venous outflow. These are commonest in the anterior part of the hemisphere. Usually thrombosis of the venous sinus occurs first with extension into cortical veins and it is the cortical venous involvement that determines the clinical severity [12].

Subarachnoid hemorrhage accounts for 10% of all stroke and approximately 80% of patients with non-traumatic SAH have ruptured saccular aneurysms. Other causes include arteriovenous malformations, cavernous angiomas, mycotic aneurysms, neoplasms, and blood dyscrasias [7,13,14].

Intracerebral hemorrhage (ICH) is most frequently caused by rupture of arteries lying deeply within brain substance which represent the lateral striate branches of MCA [11]. Intraventricular hemorrhage is seen in hemorrhagic stroke which results either from reflux of subarachnoid blood through the 4th ventricular foramina or by extension from the site of intraparenchymal hemorrhage [11]. Deep ICH is mostly found in the sites of (Putamen, Thalamus, Cerebellum, Pons lentiform nucleus) [13].

The pathological picture of primary ICH consists of a large confluent area of blood clots and seen on CT as homogenous hyper dense area surrounded by well-defined rim of edema, the degree of hyper density depends on the hematocrit value [14].

There is several risk factors for the increase of incidences of stroke which trigger great concern indicated in order to prevent future stroke occurrence.

Hypertension affects more than 20% of the adult and 3% of the pediatric populations. It is a disease course that contributes to the development of cardiovascular and renal diseases. It appears to be a polygenic, multifactorial disorder with several genes interacting with environmental factors. This is defined by a systolic blood pressure becomes greater than 140 mmHg, diastolic blood pressure becomes greater than 90 mmHg, or someone requiring antihypertensive medications for control of sustained elevations of blood pressure [15].

Blood pressure reduction in the setting of neurologic emergencies typically requires emergency CT scanning to determine diagnosis, treatment thresholds and priorities. Hypertensive encephalopathy is the clearest indication for blood pressure reduction, but vascular disorders, including ischemic stroke, must be ruled out first, and astute clinical judgment is required to differentiate between these two clinical diagnoses [16].

Ischemic heart disease is the leading cause of death among adults worldwide [1-4,16] accounting for more than 500,000 deaths annually. Atherosclerotic disease of the epicardial coronary arteries-termed coronary artery disease, accounts for the vast majority of patients with ischemic heart disease [16]. It predisposes to stroke as a source for embolism from the heart; by virtue of shared risk factors; as an untoward effect of medical and surgical treatments for coronary atherosclerotic disease [17].

Diabetes mellitus is one of the major risk factors in stroke which is a chronic disorder characterized by impaired metabolism of glucose and other energy-yielding fuels, as well as by the late development of vascular and neuropathic complications. Diabetes comprises a group of disorders involving distinct pathogenic mechanisms, for which hyperglycemia is the common denominator. Diabetes is a leading cause of both mortality and early disability in the world. It is the leading cause of blindness among working-age adults, end-stage renal disease, and non-traumatic limb amputations. Diabetes increases the risk of cardiac, cerebral, and peripheral vascular disease two- to seven-folds. A growing body of evidence, however, suggests that most if not all of the debilitating complications of diabetes can be prevented or delayed by the prospective treatment of hyperglycemia [18,19].

Cigarette smoking, a powerful risk factor for MI and sudden death, has been clearly linked to brain infarction, as well as to ICH and SAH. Smoking increases the risk of stroke by promoting atherosclerosis and increasing the levels of blood-clotting factors, such as fibrinogen. In addition to promoting conditions linked to stroke, smoking also increases the damage that results from stroke by weakening the endothelial wall of the cerebrovascular system. This leads to greater damage to the brain from events that occur in the secondary stage of stroke [17].

Patients and Methods

A prospective study was conducted on 120 adults presented to the emergency ward in Baghdad Teaching Hospital, Medical city, from February 2011 to November 2011 with clinical diagnosis of stroke.

The patients were selected during different stages of stroke from few hours to seven days after the insult as was confirmed by CT scan.

CT examination was carried out using Toshiba Aquillon scanner. Patient position was on supine, head in head rest. The scanner parallel to radiographic baseline and head is in the center of the scanning field. Slice thickness 5 mm for supratentorial scanning and for posterior fossa pathology.

Cerebral infarction was labeled when a hypodense area on a CT scan of the Brain was detected; likewise a hyperdense area on CT scan was diagnosed as intracerebral hemorrhage or sub arachnoid hemorrhage [11,14].

Demographic details, clinical history and general, physical, cardiovascular and neurological examinations were carried out on the patients and recorded on a proforma specially designed for this purpose.

Each patient was investigated for blood pressure measurements, blood glucose, blood urea, serum creatinine, electrocardiogram and CT scan of the brain.

Each CT scan was examined for the type, site and side of stroke and considering the frequency of different signs and symptoms in the different types of stroke.

Data for the distribution of the risk factors of this study (age, gender blood pressure, diabetes mellitus, smoking and ischemic heart disease) were collected from each patient according to specified criteria: Blood pressure was measured with a standard mercury sphygmomanometer; average of two readings was used for the estimation of blood pressure.

Patients were categorized as hypertensive if they were ((already diagnosed by a physician as having hypertension, on antihypertensive treatment in which systolic blood pressure \geq 140 mm of Hg and/ or diastolic blood pressure \geq 90 mm of Hg)) [18,20,21].

Random blood sugar was measured for every patient but diabetes mellitus was categorized only in patients who were previously diagnosed for either type I or type II [16,22].

Ischemic heart disease was categorized in patients who were previously diagnosed having (angina, Myocardial infarction, Cardiac care unit admission and those who are on anti-ischemic medication) [16].

Patients were considered to be smokers with more than 3 months history of smoking at least (10 - 20) cigarettes per day, (100 cigarettes during their lifetime) [18,23-25].

The data were entered and processed on the SPSS Ver.10 software. The results of the tests were subjected to statistical analysis using the same program. The numerical and categorical data was presented as percentages. Two proportions were compared using Chi square test. The level of significance was at 0.05.

Results

The total number of patients examined in this study was 120, 110 patients had positive CT findings supporting the provisional diagnosis and were analyzed, while 10 patients had negative CT examination in spite of high clinical suspicion were discarded from this study results due to; the discharge of the patients before reaching definite diagnosis after admission on their own will (5 patients), death of patient (3 patients) and (2 patients) were sent for MRI but did not perform the procedure (poor compliance).

Duration	No. of patients with suspected stroke	No. of patients with (+ve) CT findings	Sensitivity %
≤ 24 h.	23	20	86.9%
> 1d - ≤ 3d	44	40	90.9%
> 3d - ≤ 7d	53	50	94.3%
Total No.	120	110	

Table 1: The sensitivity of CT in detection of stroke.

The incidence of different types of stroke

Type of Stroke		No. of patients	%	
Isch.I.		92	83.6	
Intra cranial hemorrhage	ICH	15	13.6	16.3
	S AH	3	2.7	
Total		110	100	

Table 2: The incidence of each type of stroke in association with each other (P = 0.0001).

Stroke distribution for age and gender

The number of Patients examined were 120 (67 male and 53 female), male/female ratio (1.26), the age range was between 18 - 85y (mean 60.8 y). Isch.I had the same range of ages but a mean of (61.75)y. ICH had age range of 18 - 75y (mean 55.6y). SAH had range of 55 - 64y (mean 58.6y). The no. of males with (+ve) CT scans were 62 and the no. females with (+ve) CT scans were 48 from total of 110 patients.

Age group	Frequency	Percent
18 - 29	2	1.8
30 - 39	4	3.6
40 - 49	12	10.9
50 - 59	29	26.4
60 - 69	42	38.2
70 - 79	17	15.5
80 - 89	4	3.6
Total	110	100.0

Table 3A: Age distribution of the total number of patients with (+ve) CT findings examined for stroke.

Age group Years	Isch.I.		ICH		SAH		Total			
	Male	Female	Male	Female	Male	Female	Male	%	Female	%
18 - 29	1	1					1	1.6	1	2.08
30 - 39	2	2					2	3.22	2	4.16
40 - 49	5	4	2	1			7	11.29	5	10.41
50 - 59	12	10	3	2	2	0	17	27.4	12	25
60 - 69	20	17	3	1	0	1	23	37.09	19	39.58
70 - 79	9	5	1	2			10	16.1	7	14.58
80 - 89	2	2					2	3.22	2	4.16
Total	51	41	9	6	2	1	62	100	48	100
	92		15		3		110			

Table 3B: Age and gender distribution of the total number of patients with (+ve) CT findings examined and for each type of stroke.

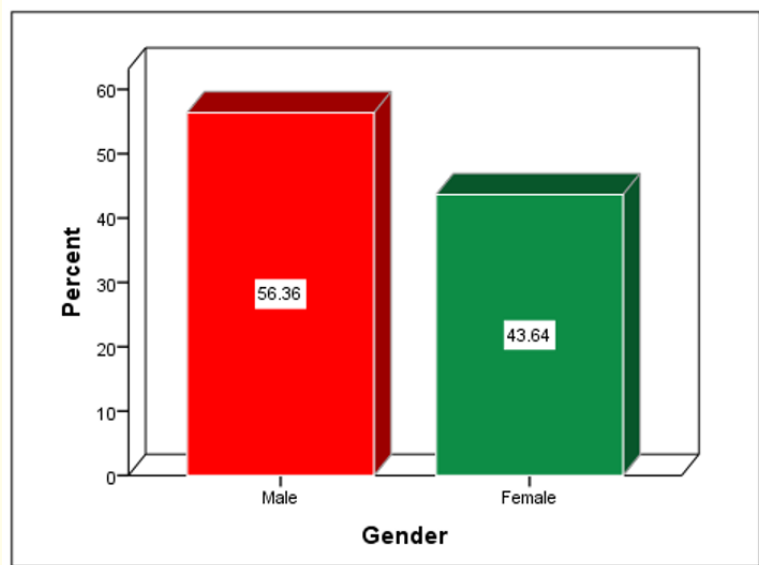


Chart 1: Gender distribution of the total number of patients with (+ve) CT findings examined stroke ($P = 0.2$).

The presentation of stroke

*Symptoms and signs	Isch.I.		ICH		SAH		total		P value
	No.	(%)	No.	(%)	No.	(%)	No.	%	
Rt. or Lt. Weakness, hemiplegia	72	78.2	9	60	1	33.3	82	74.5	0.08
Speech disturbance dysphasia, aphasia	60	65.2	4	26.6			64	58.1	
Change in level of consciousness	20	21.7	6	40	2	66.	28	25.4	0.08
Headache	10	10.8	5	33.3	3	100	18	16.3	0.0001
Convulsions	3	3.2					3	2.7	

Table 4: Frequency of different symptoms and signs in different types of stroke.
*Patients may present with more than one sign and symptom.

Risk factors associated with stroke

*Risk factor	Isch.I.		I C H		S A H		total		P value
	Pt = 92	%	Pt = 15	%	Pt = 3	%	Pt = 110	%	
Hypertension	46	50	13	73.3	2	66.6	61	55.4	0.03
D M	30	32.6	3	20	1	33.3	34	30.9	0.6
Smoking	26	28.2	5	33.3	2	66.6	33	30	0.3
IHD	18	19.5	0	0	0	0	18	16.3	

Table 5: Incidence of different risk factors in different types of stroke.
*Patients may present with more than one risk factor.

Site of stroke

*Site	Isch.I.=92		ICH = 15			
			Lobar = 10		Deep = 5	
	No.	%	No.	%	No.	%
Parietal	52	56.5	6	60		
Temporal	37	40.2	5	50		
Frontal	28	30.4	4	40		
Watershed	21	22.8				
Occipital	19	20.6	2	20		
Thalamus	17	18.4			5	100
Internal Capsule	12	13.04			3	60
Lentiform nucleus	10	10.8			1	20
Cerebellum	6	6.5				
Brain stem	3	3.2				
Caudate nucleus	2	2.1				
Hypothalamus	1	1.08				

Table 6: Frequency of involvement of different sites of the brain by Isch.I. and ICH.
 *Patients may present with a lesion in more than one site.

Side of stroke

Side	Isch.I.		ICH		Total	
	No.	%	No.	%	No.	%
Left	52	56.5	9	60	61	57
Right	23	25	5	33.3	28	26.18
Both sides	17	18.4	1	6.6	18	16.82
Total	92	100	15	100	107	100

Table 7: Frequency of involvement of each side of the brain according to Isch.I and ICH.

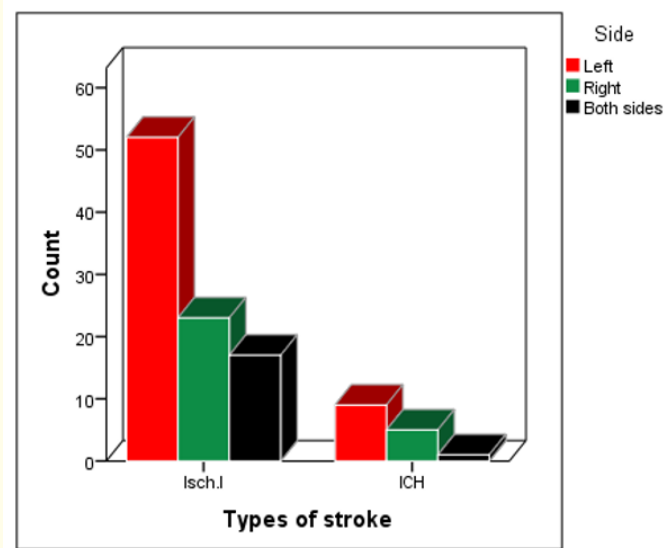


Chart 2: Frequency of involvement of each side of the brain according to Isch.I and ICH in patients with (+ve) CT findings.

Discussion

Computed tomography is one of the imaging modality of choice in the diagnosis of stroke. It is simple, quick, and straightforward for the patient. It is widely available and readily identifies the presence of hemorrhage [2].

This study finds that the incidence of Isch.I (83.6%) and intra cranial hemorrhage (16.3%)(P = 0.0001), which is comparable to other studies carried out in the developed countries as in Pulsinelli [27] who found the incidence was (80%) for Isch.I and (20%), for intra cranial hemorrhage, while Friedman [27] found the incidence was (88%) for Isch.I and (12%), also similar to Magid M El Sayed., *et al.* [28] in Hofof, Saudi Arabia (79%) for Isch.I and (20.2%), for intra cranial hemorrhage. Meaning distribution of stroke subtypes in the Baghdad, Iraq hospital based study and the neighboring countries is similar to that described among patients in community-based studies undertaken in the predominantly Caucasian populations of France, Australia, Italy, England, Denmark and Sweden [29], while it differs from studies in developing countries as in [34] India found that the incidence was (57.5%) for Isch.I and (42.5%), for intra cranial hemorrhage [1] in Pakistan found that the incidence was (58%) for Isch.I and (42%), for intra cranial hemorrhage, while [31] in Zaire, Africa found that the incidence was (64.6%) for Isch.I and 35.4%), for intra cranial hemorrhage.

Some researchers have suggested that the difference in pattern of stroke subtypes between Asian and western populations is due to dietary and lifestyle factors rather than genetics [32-34]. It is therefore possible that these factors also account for the similarity in the pattern of stroke subtypes seen in Blacks in Caribbean islands and the populations of major Western nations [32-34]. Lin-Feng., *et al.* reviewed stroke subtypes in ten populations of the Han people of China found that the average incidence of hemorrhagic stroke was higher in the Han people than in Western nations. In which, an average of (29.6%) of strokes were hemorrhagic compared to (9% - 18%) in western populations of major western nations [32-34]. Thus this means that the incidence of stroke in the western world is decreasing day by day. This is because of the better health care, proper control of hypertension, better management of heart diseases etc. in the west; while improper health care, lack of education, poverty etc. are important reasons for the increasing incidence of stroke in developing countries [1].

SAH was found in 2.7% of positive CT cases of stroke, this figure is one quarter of that reported by Pulsinelli [27] which was 10% and almost half by WM West., *et al.* [34] but similar to Magid M El Sayed., *et al.* [28] with an incidence of (2.2%) in a study of Hufof, Saudi Arabia. This may reflect the actual incidence of SAH in our stroke population.

Age and gender distribution of stroke

Stroke can affect all age groups: this study included patients from the 2nd to the 9th decade; the peak incidence was the 5th and 6th decades (P = 0.0001).

The peak incidence was one decade earlier than European and U.S.A. population who showed higher incidence for those above 75 years of age [27].

To the contrary of the known fact that stroke is uncommon below the age of 50 in developed countries. This study found that a significant percentage of patients (16.3%) were below the age of 50 and therefore stroke should be suspected in young adults, and early imaging is required to save patients' life. Causes may be referred to the inappropriate habits including poor healthy diets and lack of adequate physical exercise and sport activities with particularly poor health concern of self being.

The gender distribution of the total number of patients with stroke showed male predominance by a factor of 1.26 (P = 0.2) which is lower if compared with European countries of 1.5, but higher than in U.S.A. which amounts to approximately 1.0 [27].

Male predominance was mild in Isch.I. (1.8), while it was (1.6) in ICH, the latter is much similar to that reported of (1.5) by Pulsinelli [27], while SAH was 2 times more frequent in males.

Presentation of stroke

The commonest presentations of Isch.I and ICH were the presence of focal neurological deficit which were seen in (78.2%) of Isch.I and (60%) of ICH respectively, while in (66.6%) of SAH patients focal neurological deficit was not found ($P = 0.08$).

Due to the presence of associated Isch.I [24] stated that stroke like focal neurological deficit can be present in 37.5% of SAH whatever the cause. In these cases, CT will be the only investigation method to demonstrate SAH [27].

Severe sudden onset headache was the most common presentation of SAH (100%), which is less common in patients with ICH (33.3%) and least common in Isch.I (21.7 %) ($P = 0.0001$).

Risk factors of stroke

The most important modifiable risk factors in stroke were hypertension, DM, smoking and IHD [35]. This study found that there was a difference in the incidence of hypertension among different types of stroke, being present in (50%) of the total patients with Isch.I, while it's more common in intra cranial hemorrhage (83.3%) (15 out of total 18 patients) further classified to be present in (73.3%) of the total patients with ICH and (66.6%) of the total patients with SAH; this means that hypertension may be more associated with SAH and ICH than in Isch.I. and it needs a clinical study on hypertensive patients to prove the most likely type of stroke that affects them [35].

Hypertension was found in this study to be (55.4%) of the total 110 patients with (+ve CT) scan, being the commonest etiological factor for our stroke patients ($p = 0.03$). Kabeya Kabenkana JM., *et al.* [31] in Zaire found it to be in (83.8%) of stroke cases. Also, for Bou-douresques., *et al.* [36] who finds an incidence of (67 - 90%) of cases. NJOH [37] found that hypertension was the second etiological cause in stroke and Matuja., *et al.* [38] in Tanzania finds that hypertension was responsible only for (43 - 45%) of strokes. Coope., *et al.* [39] reported the beneficial effect of antihypertensive drugs on the control of stroke incidence, Shams-ur-Rehman., *et al.* [1] in Pakistan rated among the risk factors, hypertension as the most important risk factor for stroke, not only in hemorrhage but also in cases of cerebral infarction. Hypertension was there in 90% of the intra cranial hemorrhage and 95% of those with intracerebral hemorrhage. This is in contrast to the 64% of the intracranial hemorrhage in studies conducted in India. In this study the frequency of hypertension in cerebral infarction patients was lower and was found to be 54% [1].

Hypertension is the single most important modifiable risk factor for ischemic stroke. The risk of stroke is increased by about 25% with each 10 mm of Hg rise in systolic blood pressure. With diastolic blood pressure of more than 110 mm of Hg, the risk is 15 times more than of individual with less than 80 mm of Hg [40].

Diabetes mellitus has an incidence of (30.9 %) of the total 110 stroke patients with (+ve CT) scan, being present in (32.6%) of the total patients with Isch.I, (26.6) in of the total patients with intra cranial hemorrhage and further classified to be present in (32.6%) of the total patients with ICH and (33.3%) of the total patients with SAH ($p = 0.6$) [41].

The population-attributable risk is an estimate of the percentage of excess stroke in a population that is attributable to a given risk factor. The population-attributable risk takes into account both the prevalence and potency of a risk factor. In the United States DM is estimated to have a population attributable risk of approximately 35% [19,26]. This figure for DM is greater than the estimation of the population which are known to have an increased susceptibility to coronary, femoral, and cerebral artery atherosclerosis [19] where the findings are comparable with this study.

Hypertension is common in diabetic patients, affecting approximately 40 - 60% [17]. Surveys of stroke patients and prospective investigations have confirmed the increased risk of stroke in diabetic patients. The Honolulu Heart Program [17,19] found that increasing degrees of glucose intolerance conferred an increasing risk of thromboembolic stroke independent of other risk factors but found no relationship to hemorrhagic stroke [17,19].

Ischemic Heart Disease predisposes to stroke, although hypertension is the preeminent risk factor for strokes of all types, the prevalence of cardiac contribution to stroke increases with age. The incidence of IHD in this study with stroke is (16.3%) of the total stroke patients with (+ve) CT scan and (19.5%) of the total patients with Isch.I, which is less than the Framingham Study [17].

After 36 years of follow-up, the prevalence of cardiovascular disease among stroke cases in the Framingham Study [17] was found to be high: (80.8%) had hypertension; (32.7%) had prior coronary heart disease; (14.5%) had prior heart failure and (14.5%) had Atrial fibrillation [17].

Cardiac disease is a vast precursor of stroke as it shares the same pathology, however, the mechanism of stroke in persons with coronary heart disease is less apparent. Persons with uncomplicated angina pectoris, non-Q wave infarction, and clinically silent MI also have an increased incidence of ischemic stroke. Recent data from the Framingham Study [17] suggest that silent or unrecognized MI survivors had a 10-year incidence of stroke of 17.8% in men and 17.3% in women, an incidence, much less than the 19.5% in men and 29.3% in women seen after recognized MI [17]. Further studies are needed to understand the arterial and side distribution of stroke and effect of the role of IHD in stroke and its prevention.

Cigarette smoking, a powerful risk factor for myocardial infarction and sudden death, has been clearly linked to brain infarction, as well as to ICH and SAH [17].

Thirty percent (33 patients) out of the (110) patients with (+CT) findings in this study were smokers; in which (28.2%, 26 patients) of the 92 patients who had Isch.I and (26.6%, 7 patients) of 18 patients who had intra cranial hemorrhage happened to be smokers ($p = 0.3$).

Similar relationship between cigarette smoking and stroke has been seen in Hawaiian Japanese men after 10 years of follow-up in the Honolulu Heart Study [17], in which cigarette smoking made a significant Independent contribution to cerebral infarction and intracranial hemorrhage risk which is highly prevalent [17].

Smoking increases the risk of stroke by promotes atherosclerosis as well as increases the levels of blood-clotting factors, such as fibrinogen. In addition to promoting conditions linked to stroke, smoking also increases the damage that results from stroke by weakening the endothelial wall of the cerebrovascular system. This leads to greater damage to the brain from events that occur in the secondary stage of stroke based on data from (the Framingham Study and the Nurses' Health Study) [17]. It is clear that stroke risk in cigarette smokers is reduced by about 60% by quitting smoking. This reduction in risk occurs in a remarkably short time and is similar to the reduction in coronary heart disease risk, which decreases by approximately 50% within 1 year of smoking cessation and reaches the level of those who never smoked within 5 years [42].

In the Nurses' Health Study, a cohort of nearly 120,000 women was followed up prospectively for 8 years for the development of stroke. There was an increased risk of SAH as well as thrombotic stroke in cigarette smokers [17].

A meta-analysis of 32 separate studies, including those already cited, indicates that cigarette smoking is a significant independent contributor to stroke incidence in both sexes at all ages and is associated with about a 50% increased risk overall when compared with the risk seen for nonsmokers. The risk of stroke specifically rises as the number of cigarettes smoked per day increases, in both men and women [17,26].

Site of stroke

In this study according to the arterial distribution the most frequent sites involved by Isch.I, were the cortices of the parietal lobes (56.5%), temporal lobes (40.2%) and frontal lobes (30.4%) which were responsible for the common presentation of focal neurological deficit and speech disturbance e.g. (dysphasia, aphasia). Lobar ICH was more common (66.6%) than deep ICH (33.3%) compared to another study done in our country on "Spontaneous ICH" by Ridha and Al-Mullah [43] found that the commonest site of ICH was also lobar (75 %) followed by deep ICH (15%) [40]. Therefore, ICH in our country showed higher incidence of the lobar type in agreement with some as in for [44] (77.2%) for lobar ICH and (20.4%) for deep ICH also [45] found lobar ICH to be (54.7%) and deep (35.8%) while on the controversy [46] found that deep ICH (53%) more than the lobar ICH which was (23%).

Side of stroke

Both Isch.I. and ICH were more common in the left hemisphere in an incidence of (56.5%) and (60%) respectively than on the right hemisphere which was involved in (25%) of Isch.I. and (33.3%) of ICH. Therefore the ratio of left/right hemisphere involvement was (2.26/1) for Isch.I. and (1.8/1) for ICH (p = 0.5), this was in agreement with [47] results who found a left hemisphere predominance for Isch.I of (1.5), while there is no hemispheric difference in the haemorrhagic strokes found by Kabeya Kabenkana JM., *et al* [31].

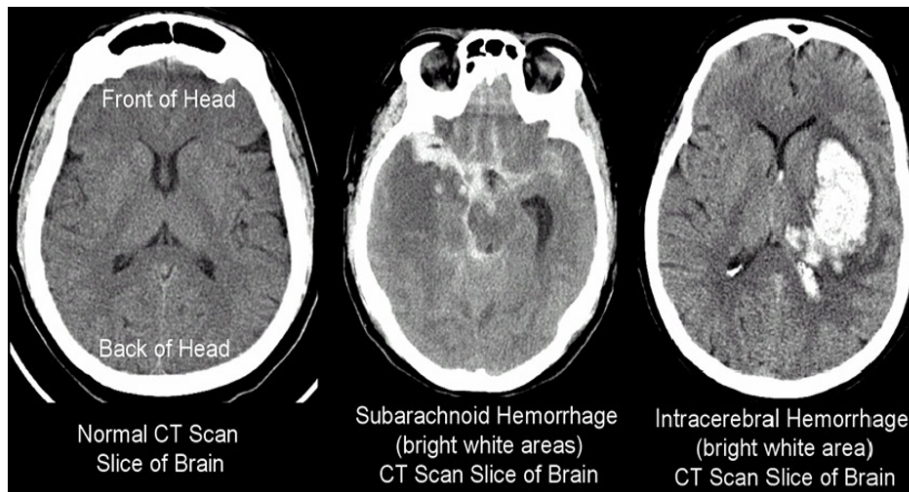


Figure 2: CT picture showing normal brain tissue SAH and ICH.

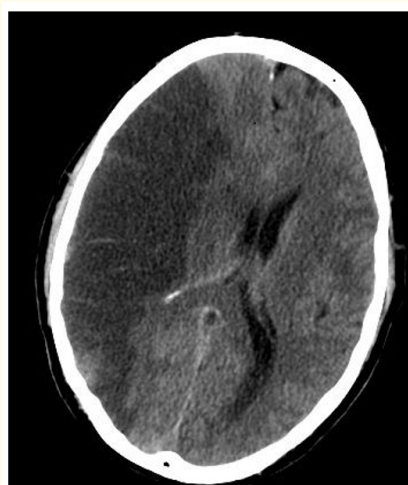


Figure 3: Brain CT showing ischemic infarction.

Conclusion

The study showed a similar pattern of stroke subtypes to studies done in Australian and European cohorts with ischemic infarcts being the most common. The pattern differed from Asian cohorts in having relatively fewer intracerebral hemorrhages.

Cerebral hemorrhage is more common in hypertensive stroke patients as compared to cerebral infarction and hypertension is most common modifiable risk factor for stroke in our country.

CT was very valuable in assessing the clinical accuracy for stroke type diagnosis, knowing the site, stage of lesion but not always the cause.

Stroke should be suspected in young adults, and early imaging is required to save patients' life.

Stroke can be prevented by treating the important risk factors.

Improper health care, lack of education, poverty etc. are important reasons for the increasing incidence of stroke in underdeveloped countries. The incidence of stroke in western world is decreasing day by day. This is because of the better health care, proper control of hypertension, better management of heart diseases etc.

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