Original Paper

Prevalence of Intracerebral Hemorrhage and Its Risk Factors among Stroke Cases Admitted to Sulaimani General Teaching Hospital

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Abstract

Background: Although hypertension remains the most common cause of non-traumatic Intracerebral hemorrhage (ICH), several other conditions and lifestyle factors have been associated with ICH such as age, gender, race differences, cigarette smoking, alcohol, drug abuse, anticoagulant treatment, dyslipidemia, and others .

Aim: Our aims are to estimate a prevalence and incidence of ICH among stroke cases within Sulaimani's people, in addition to investigate the main risk factors of patients with ICH among stroke cases admitted to General teaching hospital in Sulaimani city.

Patients and method: In this study, 108 patients with either ischemic stroke or non-traumatic ICH were enrolled; these patients were recorded in Sulaimani General Teaching Hospital with a special form of demographic data. All patients were thoroughly examined and investigated with brain CT scan for all and brain MRI for some of them.

Discussion: Out of 108 stroke patient admitted, 33 patients (30.6%) had ICH, while 75 patients (69.4%) had ischemic stroke, 19 cases (out of 33) (57.58%) of ICH patients were females, while 14 (42.42%) of them were males. Among the modifiable risk factors of ICH, hypertension remains the most common risk which was present in 25 patients out of 33 (75.8%), but dyslipidemia and diabetes mellitus were other less common risk factors which might have predisposed to the occurrence of ICH.

In conclusions: Spontaneous intracerebral hemorrhage, which is a common cause of mortality and morbidity, is relatively a common form of stroke in our locality which is more predominant in females. Hypertension is the main risk factor for spontaneous ICH.

Key words: Stroke, Intracerebral hemorrhage, Risk factors, Brain CT scan, MRI, Lipid profile Hypertension.

Introduction

Stroke is a syndrome which is characterized by the acute onset of neurological deficit, due to the acute focal central nervous system dysfunction secondary to the focal cerebral vascular insufficiency [1]. Intracerebral hemorrhage is a subtype of stroke with high morbidity and mortality accounting for about 15% of all deaths from stroke. The key factor that affects ICH outcome is the hemorrhagic volume, when the hemorrhagic volume exceeds 50ml acutely, cerebral perfusion pressure falls to zero and the patient dies, if the hemorrhagic volume is smaller than 40ml most patients survive the initial attack. However, the hematoma itself can lead to secondary brain injury by the effect of the edema on surrounding brain tissue resulting in neurological deficits and sometimes delayed fatality [2].

ICH is due predominantly to chronic hypertension and degenerative changes in cerebral arteries, in recent decades with increased awareness of the need to control blood pressure, the proportion of hemorrhage attributable to causes other than hypertension has greatly increased;

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more than half of such hemorrhages occurs in normotensive individual and the hemorrhage more often than previously arises in the locations that are not typical of hypertensive ICH [3].

Stroke is the third leading cause of death after cardiovascular diseases and all kinds of cancers, and is the most common disabling neurological disorder. Hemorrhagic stroke is particularly severe and life threatening condition with up to 40-80% of victims dying within 1st year, the incidence increases with the age with two third of all strokes occurring in those over 65 years, which is somewhat higher in men than in women, in black than in white, and also commoner in Asian population [4] .The incidence of stroke in developed countries has been decreased in recent decades, largely because of the improved treatment of hypertension [4].

ICH most commonly occurs in basal ganglia, cerebral lobes, thalamus, cerebellum, and pons. The bleeding results from rupture of the small penetrating arteries and originating from the basilar artery or the anterior, middle, or posterior cerebral artery. Degenerative changes in the vessel wall media and adventitia were developed from chronic hypertension or from deposition of B- amyloid protein in amyloidal angiopathy, particularly at or near bifurcations of affected arteries [5]. Following vessel rupture, blood under arterial pressure rapidly flows into adjacent brain areas. In the basal ganglia the blood disrupts the gray matter and spreads into the adjacent cerebral white matter, in spread between planes of white matter, leaving areas of relatively intact neural tissue.

The bleeding is stopped by temponade in 30 minutes in most patients but in 20% the haematoma continues to expand for several hours [5].

The surrounding compressed brain develops vasogenic edema from release and accumulation of osmotically active clot proteins and cytotoxic edema from compression of surrounding blood vessels, producing secondary tissue ischemia.

Within days macrophages and neutrophils accumulate in the surrounding brain to slowly invade the clot and remove blood products over several months.

In survivors, months later there is only a small cavity which is orange stained walls contains hemosiderin – laden macrophages [2].

Unfortunately, over 25% of patients, the mass from the blood clot and surrounding cerebral edema produce immensely increased ICP leading to secondary herniation and death within hours to a few days [2].

Risk factors included age, which increases the risk of stroke (ischemic and hemorrhagic) increases with the age [6]. Gender may play a role in stroke that is more common in males than in females. However, more than half of total stroke deaths occur in females. At all ages, more females die from the stroke [7]. Other risk factor is the race. African – Americans have a higher incidence of hemorrhagic and ischemic stroke than other races in the United States. The incidence of hemorrhagic stroke in Japanese population is increasing nowadays [8]. Cigarette smoking is a major cause of both ischemic and hemorrhagic stroke. It contributes to stroke by increasing the blood level of fibrinogen and other clotting factors, increasing platelet aggregability [9], decreasing HDL ,increasing cholesterol levels [10] and increasing the haematocrit [11], directly damaging the endothelium which leads to atherosclerosis [12] and acutely increasing blood pressure which may promote arterial rupture. The risk of stroke for smokers was higher for females than for males, it increases with the increasing age and with the number of cigarettes smoked per day [13]. Serum cholesterol: The relation between serum cholesterol levels and the risk of stroke is not clear, total cholesterol levels have an inverse association with hemorrhagic stroke and direct association with ischemic stroke [13]. There is an increased risk for both intracerebral and subarachnoid

hemorrhages with chronic consumption of alcohol. Alcohol causes impaired coagulation and directly affects integrity of cerebral vessels [14]. Like other cardiovascular risk factors, some studies support the direct relationship between diabetes and ICH outcome but not SAH [15]. Clinical features according to the site of haemorrhage:

1- Putaminal haemorrhage: Vomiting, headache is frequent, hemiparesis, hemianopia occur, with large haemorrhage the patient go to stupor, Coma, bilateral upgoing planter, deep – irregular respiration, fixed dilated pupils, and finally decerebrate rigidity [16].

2. Thalamic haemorrhage: The central feature is severe sensory loss on the entire contralateral body, if large or moderate size produced hemiplegia or hemiparesis, this is due to compression on internal capsule [16].

3. Pontine haemorrhage: Here deep Coma occurs in few minutes, there will be total paralysis, decerebrate rigidity and small pupil that react to light, death usually occurs within few hours [17].

4. Cerebellar haemorrhage: this usually develops over one to several hours and loss of consciousness at the onset which is unusual is associated with repeated vomiting, occipital headache, and vertigo, inability to sit, stand and walk, sometimes there may be hemiplegia, facial weakness, dysphagia and dysarthria [17].

5. Lober haemorrhage: Symptoms and signs vary according to the locations (which lobe affected) including headache, vomiting, hemiparesis, hemisensory deficits, aphasia and visual field abnormality. Seizures are more frequent than with haemorrhages in other locations, while coma is less frequent [18].

The aim of the study is to know the risk factors of patients with ICH among stroke cases admitted to General teaching hospital in Sulaimani city.

Patients and Methods

This prospective study was conducted to evaluate the prevalence and incidence of ICH and the risk factors of non-traumatic ICH among stroke cases admitted to GENERAL TEACHING HOSPITAL in Sulaimani city, from May 2007 to November 2007.The total sample size was 108 patients. All those patients who came to the hospital presented with their focal neurological deficits and with brain CT scan and /or MRI showing evidences of infarction or hemorrhage were included in the study, the age of patients were between 37-120 years. Patients with subarachnoid hemorrhage, patients whose focal deficits lasting for less than 24 hours (TIA) and those having stroke like presentation but their imaging showing space occupying lesion were excluded from this study.

Detailed history was taken, general physical and neurological examinations were carried out for all individuals (n=108), blood investigations (like full blood count, ESR, blood sugar, serum lipid profile, blood urea and electrolytes) were done in our local hospital laboratory, also ECG done for all of them. All patients had a brain CT scan (SOMATOM AR .SP version B 41 A) (without contrast) to differentiate hemorrhagic from ischemic stroke and the diagnosis are made by a consultant radiologist within 6 hours of presentation.The MRI machine which is used is (OPEN 0.2 Tesla- SEIMNIS). The site of bleeding is assessed on the basis of brain CT and /or MRI results.

Cerebrovascular risk factors for each patient were recorded:

1. Hypertension: was diagnosed by either from recall of high BP 140/90mmHg in different occasions and at different times, or from records of general practitioner and the use of antihypertensive medications, transient elevation in BP which settled without treatment was disregarded [19].

2. Diabetes mellitus: was considered if random plasma glucose concentration was equal or more than 200mg/dl in the presence of symptoms [20].

3. Smoking: smoking status was categorized as never smoked or current smoker of >20 cigarettes/day.

4. History of alcohol intake is inquired in all patients as it is one of the risk factors for ischemic stroke and ICH, and chronic alcohol consumer are those who take six or more drinks per day [21].

5. Lipid profile which is a less established risk factor (Total serum cholesterol) for each patient is estimated. (The patient was fasting 8 hours before the sample was drown), the test is done by the routine enzymatic method in outside laboratory and hypocholesterolemia can be regarded if serum cholesterol was <160mg/dl, while according to National Cholesterol education program ,there is an ATP III classification of LDL ,total and HDL cholesterol (mg/dl)[22];

*LDL cholesterol--------primary target of therapy

      <100   Optimal

100-129   near optimal, above optimal

130-159   borderline high

160-189   high

>190   very high

*Total cholesterol

<200   desirable

200-239   borderline

 >240   high

*HDL cholesterol

<40   low

>60   high

*ATP classification of Serum TG

    <150   Normal

150-199   borderline high

200-499   high

>500   very high

Statistical analysis: Data were translated into codes using a specially designed coding sheet and then converted to a computerized database. A statistical expert advice was sought and a statistical analysis was done by using SPSS (Statistical Package for Social Science) version 13. Frequency distributions for variables were done first and plotted on histograms to show the distribution of normality and confirmed by using the Chi square test. The Chi square test for the comparisons of the two proportions (from independent sample) were used, P value less than 0.05 level of significant was considered significant.

Results

ICH accounts for 30.6% of all stroke cases, while cerebral infarction accounts for the rest 69.4%. This ICH rate is approximately equal to 10 cases per 100,000 per year among population of Sulaimani city which is (656,000) (23). ICH is more common in female gender in contrast to cerebral ischemia which is more in males (P value =0.91). Both infarction and ICH increases with increasing age up to the 7th decades of life, after which it declines (p value=0.614). (Table 1) Among the risk factors, hypertension is the main risk for both types of stroke which is present in 75% of ICH and 70.7% of ischemic stroke. (Figure 1) The most common sites for ICH are cerebral lobes and basal ganglia, but other areas are also involved less frequently. (Figure 2)

Discussion

Stroke is a heterogeneous disorder that encompasses cerebral infarction (ischemia), intracerebral hemorrhage and subarachnoid hemorrhage. ICH is one of the most disabling forms of stroke, and it is the most frequent causes for hospital admission and mortality in the world. Mortality rate of 40-50% have been reported for primary intracerebral hemorrhage [24].

ICH is found in 5-10% of patients with stroke in Europe and America, but in the developing countries the lesion is far commoner, because of poorly controlled hypertension [25]. In our study we reported that the incidence rate of ICH among Sulaimani City population is about 10 cases per 100,000 per year. Also, we found that the prevalence at Sulaimani General teaching

hospital ICH accounts for (30.6%) of cases of stroke, it is well established that the management and prognosis of the acute stroke syndrome vary depending on the diagnosis of the hemorrhage or infarction.

Table 1. distributions of stroke patients according to gender and age.

	Infarction	**Hemorrhage**	**Total**
Male	45(41.67%)	14(12.96%)	59(54.63%)
Female	30(27.78%)	19(17.59%)	49(45.37%)
Age			
<40	5(6.7%)	1(3%)	6(5.6%)
40-49	2(2.7%)	3(9.1%)	5(4.6%)
50-59	13(17.3%)	8(24.2%)	21(19.4%)
60-69	22(29.3%)	8(24.2%)	30(27.8%)
70-79	24(32%)	10(30.3%)	34(31.5%)
>80	9(12%)	3(9.15)	12(11.1%)
Total	75(69.45%)	33(30.55%)	108(100%)

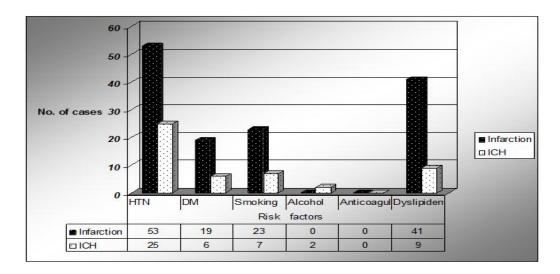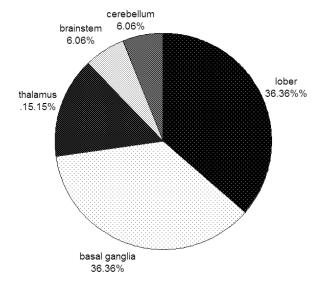|	HTN	DM	Smoking	Alcohol	Anticoagul	Dyslipiden
■ Infarction	53	19	23	0	0	41
□ ICH	25	6	7	2	0	9

Figure 1. Risk factors for ICH in compare with cerebral infarction.

Figure 2. The site of bleeding (Basal ganglia & lober are the most common sites of bleeding)

Hence it is crucial to establish the diagnosis as soon as possible. We discuss our results in the following ways:

I-Stroke subtype: Our result of ICH incident rate (10 case per 100,000 per years) is less than the numbers of a study conducted by van Asch CJ and et al. which reported about (24.6 persons per 100,000 per year) Western studies especially in United States and UK shows that hemorrhagic stroke accounts for 10-15% of all stroke cases, [26] while those studies that are done in Asia, shows that the percentage of hemorrhagic strokes were more higher than their counterparts in the Western population (40-50%). [27] Our results exhibit that the percentage of hemorrhagic stroke is 30.6% versus 69.4% of that of ischemic one, and this result is a bit higher than the Western figures but to some extents coincide with the results of the studies of Asian countries.

II-Gender: Ischemic and hemorrhagic strokes are more common in males than in females according to many studies like that which is done by Qureshi and Adnan in Atlanta [4,28], they show that 58% of cases of ICH were men and 42% were women, while we found that ischemic stroke was also more common in males (60%)versus (40%) for females , but hemorrhagic stroke in contrast to other studies was commoner in females than in males (42.4% vs. 57.6%), this may be due to either hypertension is more common in females in our locality or the hypertensive females in our locality are non-compliance with their treatments, as hypertension is the most common cause of ICH (p value= 0.91) which means that statistically there is no sex difference for ICH.

III-Age: In our study, the age of patients range from 37-120 years, the peak age of affection was between 70-79 years for both ICH and ischemic stroke, this study shows that although both ICH and ischemic stroke increases with the increasing age (increases up to the 7th decades of life and then declines), but there is no difference between either types of stroke for the specific age group.

In a study done in Saudi Arabia on 500 patients it is found that the mean age of ICH are 65.4 years for men and 66.1 years for women [29]. The mean age for males was 62 years which is a bit earlier than that of females which is 66 years. Our results did not differ from international strokes rate, indicating that age is a cosmopolitan risk factor and a strongly related to hemorrhagic and ischemic stroke.

IV-Smoking: According to Kurth et al study Smoking increases the risk of ischemic stroke 1.58 fold ,for subarachnoid hemorrhage 1.91 fold, for myocardial infarction 2.01 fold, smoking did not influence the risk for ICH [30,31], while other studies like Leslei et al who suggest that there is an increased risk of total hemorrhagic stroke, ICH, and subarachnoid hemorrhage in current cigarette smokers with graded increase in risk that depends on how many cigarettes are smoked, the effect of smoking on ICH is about the same magnitude as the effect of smoking on ischemic stroke [31]. Smoking was found to be a stronger predictor of stroke mortality than incidence [32].

In line with these observations, in our study 7 cases (Out of 33cases) (21%) of ICH, and 23 cases (Out of 75 patients) (30.7%) of ischemic cases were smokers (P value = 0.312), which suggest that smoking affects both types of stroke without a great difference.

V-Alcohol: Heavy alcohol consumption has been linked to an increased risk of total stroke (ischemic and hemorrhagic strokes). However; studies investigating the association between moderate alcohol consumption and stroke have reported conflicting results. Some studies like that of Kristi et al suggest that moderate alcohol consumption is inversely related to risk of total stroke(Ischemic and hemorrhagic), while Kurth found that moderate alcohol consumption is positively related to risk of stroke [33].

In this study only 2% of all stroke cases were chronic alcohol consumer, and no alcoholics were found among ICH cases.

VI- Hypertension: Hypertension is currently the most consistently powerful predictor of stroke; according to Kurth and Leslei studies hypertension is a factor in nearly 60- 70% of stroke [37] and hypertension increases the risk of ICH, particularly in persons who are not compliant with antihypertensive medications [34].

In Hypertension Detection and Follow up Program (HDFP) patients with hypertension, who were 30-69 years of age and received standardized antihypertensive therapy had a risk of stroke (including ICH) of 1.9 per 100 patients, as compared with a risk of 2.9 per 100 persons, in those who received routine community care [35].

The results of this indicate that hypertension is the commonest risk factor which is identified, and the most important risk factor for ICH which is found in 75% of patients with ICH, and also found in 70.7%in patients with ischemic stroke (P value =0.586), thus our study is consistent with the other studies which regard hypertension to be a main cause of ICH.

VII-Diabetes mellitus: epidemiologic and clinical data support the association of diabetes with a higher than normal prevalence of risk factors for cardiovascular disease, such as hypertension, obesity, and dyslipidemia. Although the association between diabetes and stroke may operate through such risk factors, many studies have observed an independent association of diabetes with an elevated risk of stroke (36).In this study only 6 (18.18%) of ICH cases and 19(25.33%) of ischemic patients were diabetics (P value =0.417), which was a bit higher than many other studies like that of Tanaka which suggest that DM affecting (8.5%) of Japanese ICH cases [37]. This difference might be explained by the fact that some cases were previously undiagnosed and many others were poorly controlled.

VIII- Serum Cholesterol: The relation between serum cholesterol levels and the risk of stroke is not clear. A U-shaped relation between the serum level of total cholesterol and the risk of stroke of all types have been proposed, derived from an inverse association with hemorrhagic stroke and direct association with ischemic stroke .The inverse relation along with hemorrhagic stroke has been observed in numerous studies of populations of Japanese origin, e.g. Jacob and Tanaka, in their studies, they clearly show this inverse relation although the reason behind this association are unknown [38]. Our figures showed that only [9] cases out of 33 cases (27.4%) of ICH patients and [28] cases out of 75 (37.33%) of ischemic stroke shave dyslipidemia (P value = 0.427) and most of them were hypertensive. So, dyslipidemia contribute with the other cerebrovascular risk factors to the occurrence of both ICH and cerebral ischemia.

VIII- Site of bleeding: The site of bleeding is important both in order to know the underlying cause, and the potential surgical intervention.

It is written in many texts and also supported by many studies like the results of Adnan I and Qureshi which show that the site of bleeding are as the following (in order of frequency):

1- The putamine and adjacent internal capsule (Basal ganglia) (30-40%).

2-Lober hemorrhage (central white matter of the temporal, parietal, frontal, and occipital lobes) (20-30%).

3-Thlamus (account for another 20-30%).

4- Brianstem (pontine) (5-10%).

5- Cerebellar hemorrhage (account for 5-10).

(About 2% of all primary ICH are multiple in locations) [39-41].

In this study the figures coincide with the other studies and the textbooks with a small difference that the basal ganglia hemorrhage is a little less common site for bleeding in our patients, and the results are as the following:

(lober 36.36%, basal ganglia 36.36%, thalamus 15%, brainstem 6.06% and cerebellum 6.06%) .

Conclusions

1. Intracerebral hemorrhage is relatively a common type of stroke in our locality.
2. The risk of intracerebral hemorrhage increases with age and is slightly more common in female genders.
3. Hypertension is the leading risk factor for intracerebral hemorrhage.
4. Dyslipidemia is another risk factor which may predispose to intracerebral hemorrhage in elderly hypertensive individuals.
5. Basal ganglia hemorrhage and hemorrhage into the cerebral lobes were the most common sites of bleeding.

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