Assessment of Risk Factors among Stroke Patients

Ammar Qahtan Raheem* DM, **Abid Ali Kadhem Dakhil*** EMJFS, **Tuka Younis Hassan**** MBChB

ABSTRACT

Background: Stroke is the leading cause of disability. It is the third commonest cause of death beyond coronary heart disease and cancer. It has a huge impact on public health worldwide. The worldwide estimate of five million stroke-related deaths has been predicted to be double because of the expected major demographic and lifestyle changes, including increased prevalence of smoking, obesity, hypertension and diabetes mellitus.

Objectives: Assessment of risk factors among stroke patients by clinical, echocardiographic examinations, brain CT scanning and carotids Duplex, with evaluation of modifiable risk factors.

Methods: A cross-sectional case series study was carried out on any patients from both gender aged >25 years who were complaining from weakness, aphasia or disturbed level of consciousness, clinically diagnosed as stroke and admitted to the medical ward of Al-Imam Ali hospital from 1st of January 2017 to 30th of September 2017. Informative and detailed history was obtained concerning the presence of risk factors, and essential demographic data. General, cardiological, and neurological examinations was done by physicians, in addition to brain CT-scanning and Carotids Duplex were performed.

Results: A total of 50 patients, 27(54%) male and 23(46%) female were enrolled in this study. Ischemic stroke was found in 27 patients (54%), hemorrhagic stroke was found in two patients (4%), and 21 patients (42%) considered clinically as ischemic stroke. Hypertension was found in (32) patients (64%). Diabetes mellitus was found in 19 patients (38%), smoking was reported in 19 patients (38%). Cardiovascular diseases including heart failure was found in 11 patients (22%) and atrial fibrillation was found in three patients (6%). Carotid artery stenosis was found in 20 patients (62.5%) with hypertension, 11 (91.7%) of 12 patients with history of previous stroke, and in all patients with atrial fibrillation.

Conclusions: Stroke affects late adulthood with a mean age ±SD of 59 ±107 years for male and 62 ±15 years for female. Hypertension, diabetes mellitus and smoking were the most common risk factors for stroke. Patients with history of previous stroke were at risk also for developing new one. People with multiple risk factors are more prone to develop stroke. In addition, carotid artery stenosis founded in most of patients with history of previous stroke.

Keywords: Stroke, Risk factors, Atrial fibrillation, Intracranial hemorrhage, Coronary disease, Brain ischemia.

Stroke, or cerebrovascular accident (CVA), is a clinical syndrome characterized by acute onset of loss of neurologic function that persists for at least 24 hours and reflects focal involvement of the central nervous system (CNS) and the result of a disturbance of cerebral circulation which is caused by an interruption of the blood supply to the brain[1].

The most frequent type of stroke results from cerebral infarction (ischemic stroke) 80-90% whereas in 10-20% of cases is due to intracerebral parenchymal hemorrhage[1].

Stroke is the leading cause of disability. It is the third commonest cause of death in the USA, beyond coronary heart disease (CHD) and cancer, and is assumed to be related to one in ten of all deaths[2].

Ninety five per cent of strokes occur in people age 45 and older, and two-thirds of strokes occur in those over the age of 65[3]. So, stroke often is considered a disease of elderly persons, one third of strokes occur in persons younger than 65 years[4].

The worldwide estimate of five million stroke-related deaths in 1990 has been predicted to double by 2020, with most of the increase occurring in developing

*Al-Imam Ali hospital, Al-russafa health directorate, Baghdad.
**Primary Health Care Sector in Al-Sadr city, Al-russafa health directorate, Baghdad.

countries because of the expected major demographic and lifestyle changes, including increased prevalence of smoking, obesity, hypertension (HT) and diabetes mellitus (DM) in these countries[5].

Risk factors for ischemic stroke include modifiable and non-modifiable etiologies. Identification of risk factors in each patient can uncover clues to the cause of the stroke and the most appropriate treatment and secondary prevention plan[1].

Non-modifiable risk factors include age, race, sex, ethnicity, history of migraine headaches, sickle cell disease, fibro muscular dysplasia, heredity[1].

Modifiable risk factors include; HT (the most important), DM, cardiac disease like heart failure (HF) and atrial fibrillation (AF), carotid stenosis. Lifestyle issues-excessive alcohol intake, tobacco use, illicit drug use, obesity, physical inactivity, oral contraceptive use[1].

 DM increases the risk of stroke by 2 to 3 times[6]. HT accounts for 35-50% of stroke risk[7]. Blood pressure reduction of 10 mmHg systolic or 5 mmHg diastolic reduces the risk of stroke by ~40%[8]. Lowering blood pressure has been conclusively shown to prevent both ischemic and hemorrhagic strokes[9]. It is equally important in secondary prevention[10]. Patients with AF have 5% risk of stroke[11]. The prognosis after acute ischemic stroke varies greatly, depending on the stroke severity and on the patient's premorbid condition, age, and post-stroke complications[12].

The aim of this study is to assess the influence of multiple risk factors with clinical examination, CT scanning and color Duplex study and to evaluate the modifiable risk factors.

─────────────Methods

A cross-sectional case series study was carried out on 50 patients who were admitted to the medical ward of Al-Imam Ali hospital complaining from weakness, aphasia or disturbed level of consciousness, which was clinically diagnosed as stroke from 1st of January 2017 to 30th of September 2017. All stroke patients of more than 25 years old with either sex admitted to the hospital were included in the study.

A questionnaire was designed for those patients involving information about age, sex, date of admission and the chief complaint. The questionnaire also included a history of patient's risk factors such as: HT, DM, current smoking, history of previous stroke\transient ischemic attack, and heart diseases particularly (CHD, AF and valvular heart disease).

Detailed history and information were obtained from patients. The clinical assessment of each patient in the current study done by physicians, included general examination of vital signs such as: blood pressure measuring, pulse rate and rhythm of radial artery, jugular venous pressure measuring and looking for any peripheral edema.

A standard 12-lead electrocardiography (ECG) was done to all patients (for any previous or current myocardial ischemic changes and arrhythmia) and two-dimensional echocardiography (Echo) study (for cardiac size, ejection fraction, any valvular disease and any mural thrombi) was carried out. Brain imaging included computed tomography scan (to distinguish ischemic from hemorrhagic stroke, to exclude other causes of focal neurological dysfunction and to determine size and location of lesion if present.

Duplex ultrasound study (B-mode image) and color Doppler of carotids were performed for all patients to complete their evaluation about any stenosis or obstruction of the carotid artery or its branches and for flow velocity assessment.

Statistical analysis to the data was approved by using the available statistical package of SPSS-24 (statistical package of social science, version 24). Data existed in simple measures of frequency, percentage, mean, standard deviation, and range (minimum-maximum values).

Results

A total of 50 patients, 27 (54%) males and 23 (46%) females were enrolled in this study (Male: Female Ratio= 1.17:1). The mean age of participants was (60.4±12.8) with minimum age of 35 years and the maximum age was 110 years. Mean age of males in the study was (59±10.7) which is lower compared to mean age of females (62 ± 15). There was no significant association between age and sex (p=0.5), (Table 1).

Regarding distribution of risk factors according to the sex; the study showed that HT was found in (32) patients (64%), 17 (34%) of them were male and 15 (30%) of them were female and DM was found in 19 patients (38%), 12 (24%) of them were male and 7 (14%) were female and smoking was found in 19 patients (38%), 15 (30%) of them were male while 4 patients (8%) were females. Cardiovascular diseases including HF was found in 11 patients (22%), 3 patients (6%) were males and 8 (16%) females and AF was found in 3 (6%), 2 of them (4%) were males and 1 patient (2%) was female. Previous stroke was found in 12 patients (24%), 6 (12%) of them were males and six (12%) were females. There was a statistical difference between sex and two risk factors; HF (p=0.04) and smoking (p=0.006), (Table 2).

Regarding distribution of risk factors according to age in the current study, results showed that HT, DM, AF and previous stroke mostly presented at ages between (56-65 years) in 15 (30%), 12

(24%), 2(4%), and 7(14%) patients, respectively. HF and smoking presented mostly within two categories of ages ranging between (46-55 years) and (56-65 years) in 4(8%) and 7(14%) patients respectively.

There was a statistical difference between age and DM (p=0.043), (Table 3).

Brains CT scan showed ischemic stroke in 27 patients (54%), and hemorrhagic stroke in two patients (4%).

About standard 12 - lead electrocardiography (ECG) study showed ischemic changes in 13 patients (26%) and AF in three patients (6%). Regarding the echocardiography assessment, this study shows valve disease in five patients (10%); low ejection fraction in five patients (10%). By duplex ultrasound of carotid arteries, carotid artery stenosis (<70%) were found in 24 patients (48%) and (> 70%) were found in 5 patients (10%), (Table 4). While according to the risk factors; carotid stenosis was significantly associated with history of previous stroke 11 (91.7%), (p=0.007), (Table 5).

In patients with previous stroke, high risk of having recurrent stroke contributes to many risk factors, (Table 6). There was 11 Patients (22%) with HT, 9 (18%) patients with DM, 3 (6%) patients with HF, 3 (6%) patients with AF, and 4 (8%) smoker patients. There was a statistical difference between patients with previous stroke and HT (p=0.02), DM (p=0.002), and AF (p=0.001), (Table 6).

Table 1: Distribution of stroke patients by sex and age groups.

Age Groups in Years	Sex					
	Male		Female		Total	
	No.	%	No.	%	No.	%
26-35	1	3.7	0	0	1	2
36-45	1	3.7	4	17.4	5	10
46-55	7	26	4	17.4	11	22
56-65	13	48.1	9	39.1	22	44
66-75	3	11.1	4	17.4	7	14
≥ 76	2	7.4	2	8.7	4	8
Total	27	100	23	100	50	100
Mean ±SD	59±107		62 ±15		60.4 ±12.8	

x^2 = 4.2, df = 5, P=0.5

Table 2: Distribution of risk factors according to sex.

Risk factor	Sex				Total		P value
	Male		Female				
	No.	%	No.	%	No.	%	
HT	17	34	15	30	32	64	0.86
DM	12	24	7	14	19	38	0.3
HF	3	6	8	16	11	22	0.04
AF	2	4	1	2	3	6	0.6
Previous stroke	6	12	6	12	12	24	0.75
Smoking	15	30	4	8	19	38	0.006
Total	27	54	23	46	50	100	......

Table 3: Distribution of risk factors according to age.

Age / years	HT		DM		HF		AF		Previous stroke		Smoking	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
26-35	1	2	0	0	1	2	0	0	0	0	0	0
36-45	3	6	0	0	0	0	0	0	0	0	1	2
46-55	7	14	1	2	4	8	1	2	1	2	7	14
56-65	15	30	12	24	4	8	2	4	7	14	7	14
66-75	4	8	4	8	1	2	0	0	3	6	3	6
≥ 76	2	4	2	4	1	2	0	0	1	2	1	2
Total (50)	32	64	19	38	11	22	3	6	12	24	19	38
P value	0.9		0.043		0.24		0.9		0.37		0.4	

Table 4: Distribution of the patients according to sex and radiological findings.

Radiological findings		Sex				Total		P
		Male		Female				
		No.	%	No.	%	No.	%	
Brain CT	Infarction	18	36	9	18	27	54	0.07
	Haemorrhage	0	0	2	4	2	4	
ECG	AF	2	4	1	2	3	6	0.4
	Ischemia	5	10	8	16	13	26	
Echo	Valve disease	3	6	2	4	5	10	0.8
	Low ejection friction	2	4	3	6	5	10	
Carotid stenosis	<70%	10	20	14	28	24	48	0.2
	>70%	3	6	2	4	5	10	
Total		27	54	23	46	50	100	....

Table 5: Distribution of the patients by risk factors and carotid artery (Doppler US) findings.

Risk Factor	Carotid artery (Doppler US)				Total		P value
	Stenosis		Normal				
	No.	%	No.	%	No.	%	
HT	20	62.5	12	37.5	32	100	0.4
DM	13	68.4	6	31.6	19	100	0.24
HF	8	72.7	3	27.3	11	100	0.26
AF	3	100	0	0	3	100	0.12
Previous stroke	11	91.7	1	8.3	12	100	0.007
Smoking	11	57.9	8	42.1	19	100	0.99
Total	29	58	21	42	50	100	.....

Table 6: Distribution of patients with previous stroke by risk factors.

Previous stroke	HT		DM		HF		AF		Smoking	
	No.	%	No.	%	No.	%	No.	%	No.	%
Yes	11	22	9	18	3	6	3	6	4	8
No	21	42	10	20	8	16	0	0	15	30
Total	32	64	19	38	11	22	3	6	19	38
P value	0.02		0.002		0.77		0.001		0.7	

─────────────────**Discussion**

The peak onset of developing stroke was between 55 and 64 years which involves 22 (44%) cases. This result was consistent to another study predicted that the incidence of stroke increases with each decade of life[13]. Two third of the cases occurred at age over 65 years[3].

The difference between the mean age of male and female in this study showed younger mean age for male to develop stroke (59±10.7 and 62±15 years), respectively. Sex predominance for developing stroke was found among male (male/female ratio=1.17:1). There was no significant association between age and sex (p=0.74).

The predominance of male in the current study may be due to the restless and stressful life conditions in the country especially during the last decade. This is not in total agreement with the standard results of other worldwide studies which showed that the rate of stroke among male and female are similar[14].

Hypertension was found to be the most frequent risk factor in this study (64%). This might be due to the lack of regular exercise and fatty meals intake that incorporate in high incidence of HT[15]. A poor control of this disease is also one of the important causes of high frequency among stroke patients. The frequency of HT as a risk factor in this study is higher than in Iran and turkey which was (45%) and (32.3%), respectively[16,17].

There was a significant association between age and DM (p=0.047); mostly presented at ages between (55-64 years), the frequency of DM in the current study was observed in (38%) of stroke patients making it the second modifiable risk factor. It's also higher than in Iran and Turkey which was (15%) and (24.4%), respectively[16,17]. In Sweden, 72.2% of diabetic patients were at higher risk for having stroke/TIA[18].

This might be due to increasing in prevalence of this disease in Iraq community especially type 2, Iraq facing epidemic of diabetes mellitus like that of Middle East[27].

It has prolonged period (poor detection) until diagnosis is established and its complications be apparent; whereby it is about 50% of people with diabetes remain undiagnosed and approximately 20-30% of patients usually have already developed complications before being diagnosed[28].

The frequency of smoking in this study was (38%) of stroke patients, most of them were male (30%). There was a significant association between sex and smoking, p=0.006. This was higher than Sweden study (12.6%)[18] and lower than Iranian study (40.7%)[16].

The past medical history of HF was found in (22%) of stroke patients in this study. There was a significant association between sex and HF (p=0.04), while AF was found in (6%). This may be lower than other incidence of similar diseases in Turkey which was (57.5%) of HF and (23.3%) of AF [19]. This may be due to short longevity of our patients after developing ischemic heart attacks as compared to others in developed countries and our patients die prematurely from ischemic heart disease owing to inadequate health service[15].

It has been well established that a previous history of stroke is a risk factor for stroke recurrence[20]. DM, HT, AF were also considered risk factors for recurrent stroke[21,22]. Patients with previous stroke founded to have a significant association between DM, HT, and AF (p=0.02, 0.002, 0.001, respectively).

There was a significant association between previous stroke history and having carotid stenosis (p=0.007). This result resembles that in literature[23].

An increased arterial stiffness leads to an increase in pulse pressure by a faster recurrence of the reflected wave[24]. This pulsatile stress has been shown to be a stimulus for carotid plaque rupture and associated with plaque ulceration[25]. In addition, the increased arterial stiffness may reflect an increased arterial stiffness and pulse pressure in the intracerebral vasculature[26]. All these mechanisms may lead to stroke. This might be explaining our result.

We can conclude that HT, DM and smoking were the most common risk factors for stroke. Patients with previous stroke were at risk also for developing new stroke. People with multiple risk factors are more prone to develop stroke and they consider high-risk group, and carotid stenosis is associated with a history of previous stroke.

We recommended early detection of HT by strict implication of programs for early HT detection in the primary health centers, early detection and proper management of DM by establishing specialized centers for DM management; both will contribute to the reduction of the incidence of stroke. Encouraging society to quit smoking by educating of the society about the hazards of tobacco smoking by antismoking support program. Strict management with life style changes for stroke patients to prevent recurrent stroke. In addition, measurement of carotid artery by Doppler US in patients with history of previous stroke may improve selection of high-risk patients for whom carotid endarterectomy is beneficial. As well, reduction of carotid stiffness may be an alternative treatment option in these patients. These measures may help in reduction of recurrent stroke.

References

1. Simon RP, Greenberg D, Aminoff MJ. Clinical Neurology 7th Ed. McGraw-Hill Medical. New York, NY, 2009. p. 292.
2. Rosamond W, Flegal K, Furie K, Go A, Greenlund K, Haase N, et al. Heart disease and stroke statistics--2007 update: a report from the American Heart Association Statistics Committee and Stroke Statistics Subcommittee 2007; 115(5):e69-171.
3. Goldstein LB, Adams R, Albert MJ, Apple LJ, Brass IM, Bushnell CD, et al. Primary prevention of ischemic stroke: a guideline from the American Heart Association/American stroke Association council. Circulation 2006; 113: e873 _e923.
4. American Heart Association. 2002 Heart and Stroke Facts Statistical Update. Dallas: American Heart Association; 2001.
5. Bonita R. Epidemiology of stroke. Lancet 1999; P.339: 342-4.
6. Dormandy JA, Charbonnel B, Eckland DJ, Erdmann E, Massi-Benedetti M, Moules IK, et al. Secondary prevention of macrovascular events in patients with type 2 diabetes in the Proactive Study (Prospective pioglitAzone Clinical Trial in macro Vascular Events): a randomized controlled trial. Lancet 2005; 366 (9493): 1279–89.
7. Whisnant JP. Effectiveness versus efficacy of treatment of hypertension for stroke prevention. Neurology 1996; 46 (2): 301–7.
8. Law MR, Morris JK, Wald NJ. Use of blood pressure lowering drugs in the prevention of cardiovascular disease: meta-analysis of 147 randomized trials in the context of expectations from prospective epidemiological studies. BMJ 2009; 338: b1665.
9. Psaty BM, Lumley T, Furberg CD, Schellenbaum G, Pahor M, Alderman MH, Weiss NS. Health outcomes associated with various antihypertensive therapies used as first-line agents: a network meta-analysis. JAMA 2003; 289 (19): 2534–44.
10. Gueyffier F, Boissel JP, Boutitie F, Pocock S, Coope J, Cutler J, et al. Effect antihypertensive treatment in patients having already suffered from stroke. Gathering the evidence. The INDANA (Individual Data Analysis of Antihypertensive intervention trials) Project Collaborators. Stroke 1997; 28 (12): 2557-62.
11. Wolf PA, Abbott RD, Kannel WB. Atrial fibrillation: a major contributor to stroke in the elderly. The Framingham Stud. Arch Intern Med 1987; 147 (9): 1561-4.
12. Adams HP Jr, Davis PH, Leira EC, Chang KC, Bendixen BH, Clarke WR, et al. Baseline NIH Stroke Scale score strongly predicts outcome after stroke: A report of the Trial of Org 10172 in

Acute Stroke Treatment (TOAST). Neurology 1999; 53(1):126-31.

13. Stroke: National clinical guideline for diagnosis and initial management of acute stroke and transient ischemic attack (TIA). London: Royal College of Physicians (UK); 2008.

14. Counihan TJ. Cerebrovascular Disease. In: Andreoli TE, Carpenter CCJ, Griggs RC, Bengamin I (Editors). Andreoli and Carpenters Cecil Essentials of Medicine. 7th ed. Philadelphia 2007; P. 1104-15.

15. Awad SM. Assessment of major risk factors among stroke patients. Saudi Med J 2010; 31 (9): 1031.

16. Masoud SA. A survey on the prevalence of stroke risk factors in CVA diagnosed patients, Hospitalized in Shahid Behshti Hospital in 1998. Iranian J Pub Health 2002; 31:21-22.

17. Somay G, Topaloglu O, Somay H, Araal O, Usak Halac G, Bulkan M. Cerebrovascular risk factors and stroke subtypes in different age groups. A hospital-based study. Turk J Med Sci 2006; 36:23-29.

18. Sloma A, Backlund LG, Strender LE, Skånér Y. Knowledge of stroke risk factors among primary care patients with previous stroke or TIA: a questionnaire study. BMC Family Practice 2010, 11:47.

19. Yalcin E, Yalcin M, Celik Y, Topaloglu P, Iden M. Risk factor of recurrent Ischemic stroke in Turkey. Medical Journal of Trakya University 2008; 25:117-23.

20. Furie KL, Kasner SE, Adams RJ, Albers GW, Bush RL, Fagan SC, et al. Guidelines for the prevention of stroke in patients with stroke or transient ischemic attack: a guideline for healthcare professionals from the American Heart Association/American Stroke Association. Stroke 2011; 42:227-76.

21. Bushnell CD, Colón-Emeric CS. Secondary stroke prevention strategies for the oldest patients: possibilities and challenges. Drugs Aging 2009; 26:209-30.

22. Kaplan RC, Tirschwell DL, Longstreth WT Jr, Manolio TA, Heckbert SR, Lefkowitz D, et al. Vascular events, mortality, and preventive therapy following ischemic stroke in the elderly. Neurology 2005; 65(6): 835-42.

23. Dijk J M, van der Graaf Y, Grobbee D E, Bots M L. SMART Study Group. Carotid stiffness indicates risk of ischemic stroke and TIA in patients with internal carotid artery stenosis. Stroke 2004; 35:2258-62.

24. Safar ME, Blacher J, Mourad JJ, London GM. Stiffness of carotid artery wall material and blood pressure in humans: application to antihypertensive therapy and stroke prevention. Stroke, 2000; 31:782-90.

25. Lovett JK, Howard SC, Rothwell PM. Pulse pressure is independently associated with carotid plaque ulceration. J Hypertens 2003; 21: 1669-76.

26. Nichols WW, O'Rourke MF. Properties of the arterial wall: theory. In: McDonald's Blood Flow in Arteries: Theoretical, Experimental and Clinical Principles. 4th ed. London, UK: Edward Arnold. 1998. P. 54-72.

27. Mansour A, Al Douri F. Diabetes in Iraq: Facing the Epidemic. A systematic Review. Wulfenia. 2015; 22: 258.

28. Gillies CL, Lambert PC, Abrams KR et al. Different strategies for screening and prevention of type 2 diabetes in adults: cost effectiveness analysis. BMJ 2008; 336(7654):1180-5.