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Full Length Research Paper

Risk factors and predictors of early mortality after acute stroke: hospital based study

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To determine the predictors of 30-days intra-hospital case fatality rate in patients with first-ever acute stroke in tertiary case Al Farwaniyah hospital in Kuwait and Daping hospital in China. A cross-sectional observational study This is a cross-sectional study which included 134 patients with acute first-ever stroke 70 cases admitted to Al-Farwaniyah hospital intensive care unit in Kuwait and 64 cases in Daping hospital intensive care in China. Uniform information was obtained using standard format documenting risk factors, neurological clinical presentation at the time of admission, admission Glasgow Coma Score (GCS) and Barthel index, blood pressure, random blood glucose level and presence of complications. All patient were closely followed up to monitor progress of these cases. The end point was mortality or survival at 30 days from stroke onset. The 30-days case fatality rate was 22.4% age, sex, hypertension had no impact on mortality. Haemorrhagic ($p=0.04$), low GCS ($p=0.001$), low Barthel index $< 5/20$ ($p=0.001$), diabetes mellitus ($p=0.001$) and middle cerebral artery infarct i.e MCA ($p=0.001$) on admission were important predictors of mortality. Hypertension and diabetes mellitus are the most common risk factors of stroke among patients admitted to Farwaniyah hospital – Kuwait and Daping hospital in China. Significant predictors of one-month mortality include admission GCS, its deterioration and haemorrhagic stroke.

Keywords: Intensive care unit, ischemic stroke, haemorrhagic stroke, Glasgow Coma Score, outcome, survival

INTRODUCTION

Cerebrovascular stroke has been defined as acute loss of focal and times global (applied to patients in deep coma and to those with subarachnoid hemorrhage) cerebral functions; the symptoms lasting for more than 24 hours or leading to death and with no apparent cause other than

vascular origin (Hatano, 1973). Stroke is the third leading cause of death after ischemic heart disease and cancer in many developed countries. It is one of the most important causes of long hospital admission and long term disability in the most industrialized populations. It causes a major financial burden on medical health care, it also causes extensive human and family prolonged functional disability and associated mortality (Ostfield, 1980). The main types of stroke are ischemic and haemorrhagic. Defining stroke types helps in determining

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the most effective therapy and is clearly related to prognosis.

Computed tomography or magnetic resonance imaging should be performed to confirm the type of stroke. The main goal of treatment is to maximize physical and cognitive function by limiting acute complications and facilitating rehabilitation (olf et al., 1986; Hajat et al., 2001).

Stroke occurs predominantly in middle and late years of life. Most ischaemic strokes occur between the ages of 71 and 80 years while most haemorrhagic strokes occur between 60 and 70 years (Colombo et al., 1989). The studies on the epidemiology of stroke are comparatively more limited especially in developing than developed countries. In India for example, there is only a study with a population – based data. The prevalence of stroke varies from 40 to 270 per 100.000 in rural population in different regions of India, compared to much higher prevalence in western countries 400-800 per 100.000 of population, this may be attributed to ethnic, socio-economic and dietary factors (Dhamija and Dhamiga, 1998).

The Besancon Stroke Registry (Moulin et al., 1997) has reported an in-hospital mortality of 13.6%, with the highest mortality in patients with primary intracranial haemorrhage. Independent predictors for poor outcome were: age > 70 years, patient who deteriorated within 48 hours of admission, major cognitive syndrome, heperlycaemia, female gender and regressive stroke onset. Age, intracerebral bleed, diabetes mellitus and cardiac disease were also poor predictors of the outcome in the study done by Lefkovitis et al (1992) (Lefkovitis et al., 1992). The overall in-hospital mortality as 19%.

PATIENTS AND METHODS

All patients with stroke admitted to intensive care unit Farwaniya Hospital for 1 years between 1-6-2010 to 31-5-2011 with a clinical diagnosis of stroke included in the study. All patients routinely had done brain CT scan within 24 hours of admission to determine the type of stroke. On admission, patients and 134 relatives were interviewed to obtain information pertaining to the onset of stroke and the pre-existing risk factors, including hypertension, diabetes mellitus, hyperlipidaemia, smoking, ischaemic heart disease, atrial fibrillation and previous transient ischaemic attacks. Hyperlipidaemia is defined when total cholesterol > 5.7 mmol/L and triglycerides > 2.3 mmol/litre, a trial fibrillation and ischaemic heart disease were diagnosed by ECG done during admission hospital stay, GCS, blood glucose level, systolic and diastolic blood pressure test.

Physical examination was performed for all patients with stroke. Baseline investigations included a full blood count i.e CBC, renal profile, random blood glucose, erythrocyte sedimentation rate (ESR), electrocardiography and fasting lipid profile.

Duration of hospital stay was recorded. Predictors of one-month mortality were: Systolic and diastolic hypertension, hyperglycemia, type of stroke, age \geq 70 and poor Glasgow Coma Score (GCS) on admission and deterioration of score were assessed during this period. Also Barthel Index was estimated for each case.

Statistical Analysis

All data were entered and analyzed using SPSS version 12.0 . All comparisons of risk factors between ischaemic and haemorrhagic stroke were analyzed using the Chi-square test. Comparisons of age, duration of hospital stay, GCS, blood glucose level, systolic and diastolic blood pressures were compared and analyzed using student t test. The predictors of one – month mortality were assessed using multivariate analysis and logistic regression.

RESULTS

The study conducted through a period of 1 year, 134 patients with stroke, 70 cases in Al Farwaniyah intensive care unit in Kuwait and 64 cases in Daping hospital intensive care in China. The cases were identified and included in the study. The mean age was 64 ± 11 years in ischaemic stroke and 65 ± 10 years in haemorrhagic stroke group.

Ninety six patients with wtroke (71.6%) have had ischaemic stroke and 38 patient (28.4%) have had haemorrhagic stroke. The majority of patients with stroke were presented at their admission by coma in 23.1% of cases and transient ischaemic attacks in 23.9% of cases with stroke (table 1), followed by aphasia and left hemiplegia in 13.4% of cases with stroke, 9% of cases with stroke were presented by confusion and dizziness (Table1).

Risk Factors

Hypertension was the commonest risk factor in both patients groups i.e ischaemic and haemorrhagic patients (70.8% of ischaemic stroke patients and 73.7% of haemorrhagic (Patients), followed by diabetes mellitus in ischaemic stroke, (44.8% of ischaemic stroke patients),

Table 1. Neurological clinical presentation at the onset of hospital admission

Neurological Clinical Presentation	Number of Cases	
	No. = 134	
	N	%
Coma	31	23.1
Confusion	12	9.00
Aphasia	18	13.4
Right hemiplegia	12	8.9
Left hemiplegia	18	13.4
Dizziness	9	6.7
Transient ischemic attacks	32	23.9
Convulsions	2	1.5

Table 2. Risk Factors in ischaemic and haemorrhagic stroke

Risk Factors	Ischaemic stroke		Haemorrhagic stroke		P Value
	N=96		N=38		
	No	%	No	%	
Hypertension	68	70.8	28	73.7	0.91
Diabetes Mellitus	43	44.8	10	26.3	0.076
Ischamic heart disease	26	27.1	3	8.0	0.028
Hyperlipidaemia	40	41.7	9	23.7	0.08
Transient ischemic attacks	28	29.1	4	10.5	0.04
Smoking	22	22.9	8	21.1	0.99

Table 3. Clinical Characteristic of ischaemic and haemorrhagic stroke patients

Risk Factors	Ischaemic stroke		Haemorrhagic stroke		P Value
	N=96		N=38		
Age (mean \pm SD)	64 \pm 11		65 \pm 10		0.63
Male	55 (57.3)		20 (52.6)		0.77
Days of stay in hospital	5.7 \pm 7.4		8.5 \pm 9.4		0.07
GCS on admission	13 \pm 2		11 \pm 3		<0.001
Random blood glucose	10.15 \pm 5.3		7.8 \pm 3.2		0.012
Systolic blood pressure	167 \pm 35		191 \pm 33		<0.001
Diastolic blood pressure	96 \pm 18		106 \pm 18		<0.004
Worsening of GCS < 9	11 (11.5)		15 (39.4)		<0.001
Hemiplegia	21 (21.9)		9 (23.7)		0.99
Death	12 (12.5)		18 (47.4)		<0.001

* () in percentage

Table 4. Predictors of early mortality among stroke patients

Risk Factors	Odds Ratio	P Value	Confidence interval
Age > 70 years	2.65	0.06	0.98-8.89
Male sex	1.25	0.8	0.76-5.59
Diabetes Mellitus	3.84	0.001	1.27-18.9
Haemorrhagic stroke	3.61	0.04	1.82-9.89
Hypertension	1.56	0.7	0.48-5.64
GCS < 9	3.8	0.001	1.02-14.7
Worsening of GCS	43.15	0.0001	15.73-147.25
Barthel Index < 5/20	4.3	0.001	1.2-17.5
MCA infarct i.e. middle cerebral artery infarction	13.2	0.001	4.6-44.8

Table 5. Outcome of stroke after 1 month

Outcome of stroke	Number of cases = 134	
	No	%
Death	30	22.4
Improved with neurological deficits	36	26.9
Improved without neurological deficits	33	24.6
Vegetative i.e. patients with psychological symptoms	35	26.1

then hyperlipidaemia in 41.7% of stroke patients, then transient ischaemic attacks in 29%, then ischaemic heart disease in 27% and finally smoking was a risk factor for 22 patient with ischaemic stroke (i.e. 22.9% of patients).

In haemorrhagic group, hypertension was the commonest risk factor followed by diabetes mellitus in 26.3% of patients, then hyperlipidaemia in 23.7% of patients, then smoking in 21.1% , transient ischaemic attacks in 10.5% of patients, then ischaemic heart disease in 8% of haemorrhagic stroke patients.(table 2).

In this. Study, early mortality i.e. death after one month was 22.4% of total cases with stroke, 18 patient with haemorrhagic stroke about 60% of mortalities and 12 patients with ischaemic stroke i.e 40% of total mortality (table 5). On using multivariate analysis and logistic regression, worsening of GCS < 9 on admission and haemorrhagic stroke were the independent predictors of early mortality.

The relationship between risk factors, admission parameters (diabetes mellitus, hypertensionm GSC score, Barthel index and MCA infarct), types of stroke and mortality were also studied. The independent risk factors of mortality were diabetes mellitus, haemorrhagic stroke, GCS less than 9, Barthel Index less than 5/20 and MCA infarction i.e middle cerebral artery infarct (Table 4).

DISCUSSION

Identification of predictors of case fatality, following acute stroke, is an important parameter as it provides a basis for planning management protocols aiming to prevent, and control of such factors in order to improve survival. In the present study, death occurred in 30 patients with stroke (22.4% of all patients), several factors are known to influence early the incidence of stroke. Hypertension was the commonest risk factor identified overall and for both types of stroke. Studies conducted in developed countries like Ireland (MC Dannell et al., 2000), France (Giroud et al., 1991) and in developing countries like Turkey (Kumral et al., 1998) and India (Kaul et al., 2000) have showed the same result. Diabetes mellitus was the second risk factor in patients with ischemic stroke, Then followed by hyperlipidaemia, Then transient ischemic

attacks, followed by ischaemic heart disease and smoking.

The influence of age on stroke outcome is still a matter of debate, while several studies showed a negative effect, other studies showed no influence (Ashsio et al., 1984; Asplund et al., 1992). In this study there was no impact of age on the survival of the patient. Also for sex the study revealed no effect and any significant gender differences in mortality. The 30-day mortality in Framingham cohorts study showed 14% mortality rate in men compared to 20% in women (Kelly-Hayes et al., 1988).

There is a great evidence that hyperlipidaemia is a risk factor for ischaemic stroke, although all relevant studies included patients with ischaemic heart disease as a co-morbid disease. Clinical trial using statins to lower blood levels of cholesterol have reported 29% reduction in incidence of stroke in patients using such drugs (Herbert et al., 1997; Sack et al., 1995). Hyperlipidemia was reported in 36.6% of patients presented with stroke and considered as the third major risk factor for development of stroke in patients in this study. There was no significant statistical difference in the occurrence of hyperlipidaemia in both types of stroke ($p=0.23$).

The overall mortality rate in this study was 22.4% of all cases admitted with stroke, 12.5% for ischaemic stroke and 47.4% for haemorrhagic stroke. This result is similar to that reported in other studies (Branska et al., 1993; Hung, 1993; Aswavichienjinda and Boongird, 1998).

These 30 days case – fatality rate are in close agreement with Framingham study (Sacco et al., 1982), except for patients with intra-cerebral hemorrhage, where the Framingham rate (82%) was considerable higher than in our series (47.4%). This can be explained in part by the smaller number of CT scanned patients in Framingham series (CT scanning will detect small haemorrhagic which have a better prognosis).

Death has occurred after a mean age of 10 days after admission for ischaemic stroke and 4 days for haemorrhagic stroke. Wong 1999, in reporting an Asian Joint Stroke mortality study involved 2403 patients, has found that the mean duration from admission to death was 12.9 days for ischaemic stroke and 7.3 days for haemorrhagic stroke . Early death within first 7 days has

been attributed to direct effects of neurological damage, whereas death during 7-30 days were mainly from immobility (Bamford et al., 1990).

In this study, we found that worsening of GCS < 9 and haemorrhagic stroke were reported as independent risk factor for early mortality. In a study of 124 stroke patients requiring mechanical ventilation in an ICU, only third survived at 1 year after admission, age > 65 years and GCS < 10 on admission carried the poorest prognosis (Steiner et al., 1997). In another study of 230 stroke patients, more than one-half of patients died during hospitalization due to low GCS scores < 10, particularly with impaired brainstem signs (Gujjar et al., 1998).

Haemorrhagic stroke was the other predictor of early mortality. This poor prognosis in haemorrhagic stroke than ischaemic stroke may be probably due to lower GCS score at admission (average GCS 10 vs 13). A greater number of patients with haemorrhagic stroke 47.4% than ischaemic stroke 12.5% died. Jover-Saenz et al and Mbala et al have reported similar findings.

We found that also middle cerebral artery infarct i.e. MCA, diabetes mellitus, Barthel index < 5/20 were significant independent risk factors for in-hospital mortality after stroke. The finding that admission hyperglycaemia is a predictor of early mortality. This finding was reported in other studies as Adams et al 2003 and Williams et al 2002 as it is identified that admission hyperglycaemia leads to anaerobic glycolysis in the ischemic penumbra with release of lactic acid and free radicals with subsequent direct membrane lipid peroxidation and cell lyses (Lindsberg and Roine, 2004), leading to extension of the area of infarction and worsening of the neurological deficit with high chances of developing complications.

This study has reported that 30 patients died after stroke, the cause of death varied, 6 patients died from pneumonia, 4 patients from septicemia, 8 patients from transtentorial herniation, 4 patients from cardiac causes, 4 patients from pulmonary embolism and 4 patients with sudden death and unknown cause.

In conclusion, the in-hospital mortality rate in this study was relatively similar compared to other epidemiological studies. The independent risk factors were diabetes mellitus, poor GCS, MCA infarction, hemorrhagic stroke. The limitation of this study was that the assessment was done merely during in-patient period and hence the mortality after discharge was not included in the analysis.

REFERENCES

- Adams HP Jr, Adams RJ, Bott T, del zoppo GJ, Furlan A, Goldstein LB, et al (2003). Guidelines for the early management of patients with ischemic stroke. A scientific statement from the stroke council of the American Stroke Association. *Stroke*. 34: 1056-1083.
- Ashlso B, Britton M, Murray V, Theorell T (1984). Disability and quality of life after stroke. *Stroke*. 15 (5): 886-890.
- Asplund K, Calberg B, Sundstorm G (1992). Stroke in the elderly. Observations in a population based sample of hospitalized patients. *Cerebrovasc. Dis.* 2: 152-157.
- Aswavichienjinda T, Boongird P (1998). cerebrovascular disease in North East Thailand. *Neurol. J. Southeast Asia*. 3:27-33.
- Bamford J, Dennis MS, Sandercock P, Burn J, Warlow C (1990). The frequency, cause and timing of death within 30 days of a first ever stroke. The oxfordshire Community Stroke Project. *J. Neurol. Neurosurg. Psychiatr.* 53:824-829.
- Branska GM, Ryglewicz D, Lechivicz w, Mendel T, Weissbein T (1993). Risk factors in patients with stroke. *Neurochir. Pol.* 27: 625-632.
- Colombo A, Faglioni P, Marzullo M, Scarpa M, Sorgato P (1989). Risk factors and short term prognosis in ischemic and hemorrhagic attacks: review of 503 patients admitted to neurologic clinic of Modena. *Riv. Neurol.* 59:1-7.
- Dhamija RK, Dhamiga SB (1998). Prevalence of stroke in rural community – an overview of Indian experience. *J. Assoc. physicians India*. 46 (4) : 351-354
- Giroud M, Milan C, Beuriat P, Gras P, Essayagh E, Arveux P, Dumas R (1991). Incidence and survival rates during a two-year period of intracerebral and subarachnoid haemorrhages, cortical infarcts, lacunes and transient ischaemic attacks: the stroke registry of Dijon: 1985-1989. *Int. J. Epidemiol.* 20:892-899.
- Gujjar Ar, Diebert E, Manno EM, Duff S, Diringer MN (1998). Mechanical ventilation for ischaemic stroke and intracerebral haemorrhage indications, timing and outcome. *Neurol.* 51:447-51.
- Hajat C, Dundas R, Stewart JA et al (2001). Cerebro vascular risk factors and stroke subtypes: differences between ethnic groups. *Stroke*. 32:37-42.
- Hatano S (1973). Control of stroke in the community, Methodological consideration and protocol of WHO stroke register. Geneva WHO 1973, document no. CVD/S/73.6 Rev.1
- Herbert PR, Gaziano JM, Chan KS, Hennekens CH (1997). Cholesterol lowering with statin drugs, risk of stroke and total mortality : an overview of randomized trials. *JAMA*. 278:313-321.
- Hung TP (1993). Changes in mortality from cerebrovascular disease and clinical pattern of stroke in Taiwan . *J. form Med. Ass.* 92:687-696
- Jover – Saenz A, Porcel – Perez JM, Vives-soto M, Rubio – Caballero M (1999). Epidemiology of acute cerebrovascular disease in Lleida from 1996-1997. Predictive factors of mortality at short and medium term. *Neurol.* 28:94-98.
- Kaul S, Venkateswamy P, Meena AK, Sahay R, Murthy JM (2000). Frequency, Clinical features and risk factors of lacunar infarction (data from a stroke registry in South India). *Neurol. India*. 169:253-257.
- Kelly-Hayes M, Wolf PA, Kannel WB, Sytkowski P, D'Agostino RB, Gresham GE (1988). Factors influencing survival and need for institutionalization following stroke, The Framingham study. *Arch. Phys. Med. Rehabil.* 69: 415-418.
- Kumral E, Ozkaya B, Sagduyu A, et al (1998). The Ege stroke Registry: a hospital – based study in Aegean region, Izmir, Turkey. *Cerebrovasc. Dis.* 8: 278-88
- Lefkowitz J, Davis SM, Rossiter SC, et al (1992). Acute stroke outcome: effects of stroke type and risk factors. *Aust. NZ. J. Med.* 22:30-35.
- Lindsberg PJ, Roine RO (2004). Hyperglycaemia in acute stroke . *Stroke*; 32:363-64.
- Mbala – Mukendi M, Tamlow MJ, Dikassa LN, M Buyamba – Kabangu JR (1995). Initial arterial pressure and prognosis of cerebrovascular accidents- *Arch. Mal. Coeur. vaiss.* 88: 21-25.
- MC Dannell R, Fan CW, Johnson z, Crowe M (2000). Prevalence of risk factors for ischaemic stroke and their treatment among a cohort of stroke patients in Dublin. *Ir. J. Med. Sci.* 169: 253-257.
- Moulin T, Tatu L, Chavot D et al (1997). Besancon Stroke Registry: an acute stroke registry of 2500 consecutive patients. *Euro Neuro.* 38:10-20
- Ostfield AM (1980). A review of stroke epidemiology. *Epidemiol. Rev.* 2: 136-152.
- Sacco RL, Wolf PA, Kannel WB, MC Namara (1982). Survival and recurrence following stroke, the Framingham study. *Stroke*. 13:290-295
- Sack FM, Pfeffer MA, Moye LA, et al (1995). Prevention of coronary artery disease with pravastatin in men with hypercholesterolemia. *N. Engl. J. Med.* 333:1301-1307.

Steiner T, Mendoza G, De Georgia M, Schellinger P, Holle R, Hacke W (1997). Prognosis of stroke patients requiring mechanical ventilation in a neurological care unit. *Stroke*; 28:711-715.

Williams LS, Rotich J, Qi R, Fineberg N, Espay A, Bruno A, et al (2002). Effects of admission hyperglycaemia on mortality and costs in acute ischemic stroke. *Neurol.* 59:67-71.

Wolf PA, Kannel WB, MC Gec DL (1986). Prevention of ischemic stroke: risk factors. *Stroke EDS*. Barnett HJM, Churchill Livingstone. Edinburgh, London, , pp. 967-988.

Wong KS (1999). Risk factors for early death in acute ischaemic stroke and intracerebral haemorrhage: a prospective hospital-based study in Asia. *Stroke.* 30:2326-2330.