Prognosis and outcome of acute stroke in the University College Hospital Ibadan, Nigeria

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Abstract

Background: Many factors influence the outcome of acute stroke, the third leading cause of morbidity and mortality globally.
Objective: To identify the determinants of outcome of acute stroke.
Materials and Methods: A prospectively study of 66 adult patients who presented to the medical emergency unit of University College Hospital (U.C.H), Ibadan, in coma from acute stroke, from August 2004 to March 2005, was undertaken after obtaining ethical clearance and written consent of the patients' relations.
Result: Acute stroke constituted 33% of medical coma, 3.2% of hospital emergencies, 1.0% of total hospital admissions, and 7.3% of medical deaths during the study period. The stroke subtypes were intracerebral hemorrhage (78.8%) and large cerebral infarction (21.2%) with respective case fatalities of 69.7% and 13.6% at 4 weeks. Males constituted 75.8% of the patient population with sex-specific mortality of 68.2%. The highest age specific mortality of 65.2% was in the 40-59 years group. The common risk factors were systemic hypertension, obesity, alcohol/substance abuse, and diabetes mellitus. Co-morbidities included aspiration pneumonia, recurrent seizures, hyperglycemia, and sepsis.
Conclusion: Age above 39 years, male gender, systemic hypertension, early onset of coma after stroke, and presence of co-morbidities were associated with poor stroke outcome.

Key words: Acute stroke, coma, outcome

Introduction

Stroke is defined as a sudden non-convulsive focal or global neurological deficit lasting more than 24 hours or leading to death with no apparent cause other than a pathological process of blood vessel.[1] The incidence of stroke is 254/100,000 person years in the United Kingdom (UK), 330,000/100,000 in Taiwan, and varies between 100 and 300/100,000 in the United State of America (USA).[2] There are no reliable figures for the developing world. In Nigeria, the Report of a Stroke Registry in Ibadan gave the incidence of stroke as 26/100,000 populations in 1977,[3] but the result of a recent study in an urban community in Lagos gave an overall crude prevalence rate of 1.14/1,000.[4]

According to World Health Organization (WHO), stroke is the third leading cause of mortality worldwide (after cancer and ischemic heart disease), accounting for approximately 4.6 million deaths annually.[2,5] In industrialized countries, it accounted for about 10% of all deaths,[6] and in Nigerian hospitals, it constituted 3.7% of emergency admissions, 8.7% of medical admissions, and 4-17% of medical deaths.[7-11] Elsewhere in Africa, it accounted for 3.5% of all causes of hospital deaths; 8% of admissions at Korle Bu Hospital, Ghana, and 3.7% of total admissions in Ugandan hospitals.[3] Case fatality for stroke is generally accepted to be 12% within the first 7 days and 19% at 1 month for first-ever stroke, falling drastically to about 9% per annum after the first 30 days.[12]

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Hemorrhagic strokes and total anterior circulation infarcts are associated with the highest risk of early death either from the compressive effects of cerebral edema, hydrocephalus, and hematoma or from cardiac complications.[6,7] Late deaths are usually due to the consequences of immobilization, recurrent seizures, and stroke recurrence.[12] Because of these and other factors which have been associated with the outcome of acute stroke, this hospital-based study was undertaken to identify prognostic factors that affected the outcome of acute stroke in adult patients at the University College Hospital, Ibadan.

Materials and Methods

Sixty-six patients (aged ≥16 years) with a diagnosis of acute stroke,[13] who presented in coma to the medical emergency unit of the University College Hospital (U.C.H), Ibadan, from August 2004 to March 2005, were studied. This was part of a prospective study of the prognosis of medical coma involving a total of 200 patients, which was done with the permission of the Institutional Research Committee of the Hospital and the written consent of the patients' relations. Stroke patients who presented after 7 days of ictus or patients with Glasgow Coma Scale, (GCS) score > 8 were excluded from the study.

The initial and subsequent evaluations of each patient were performed according to methods described by Teasdale and Jennett, 1974;[14] Malik and Hess, 2002,[15] and Fisher, 1969[16] using a structured protocol designed to capture

(a) Relevant risk factors from
  i.   History: The socio-demographic characteristics (particularly age, sex, alcohol, tobacco and substance abuse, history of diabetes mellitus (DM) and/or systemic hypertension, the duration of stroke before onset of coma, duration of stroke before presentation for medical care, history of previous stroke, and family history of stroke
  ii. Physical/ neurological examinations: Presence of pyrexia, systemic hypertension, obesity and heart diseases, depth of coma, and severity of stroke
  iii. Laboratory results: Presence of hyperglycemia, hyperlipidemia, human immunodeficiency virus (HIV) sero-positivity, and renal diseases.
(b) Associated co-morbidities and/or complications.
(c) Brain computerized tomographic (CT) scan and/or postmortem examinations results. Stroke sub-types were confirmed by brain CT scan in 55 patients; by postmortem examinations in 4 patients who died within 24 hours of presentation, and on clinical grounds alone in 7 patients.

After initial evaluation at the emergency room, patients were transferred either to the intensive care unit or the medical ward where they were monitored daily for a maximum of 28 days for outcome.[14] However, a study was terminated and an outcome recorded (as death) if a patient died before the 28th day.

Statistical analysis

Data were analyzed using the EFI INFO 6 statistical software. Means and standard deviation were used to describe continuous variables, and proportions were used for categorized data. The Students' "t" test was used to compare means of two continuous variables. All identified prognostic factors were subjected to both multiple responses and multiple regression analyses. Significant variables were then subjected to Pearson's correlation coefficient to determine their level of association with poor outcome. P values < 0.05 were considered statistically significant.

Results

Acute stroke constituted 33% of causes of medical coma, 3.2% of hospital emergencies, 1.0% of total hospital admission,s and 7.3% of medical deaths during the 8-month study period. The patient population consisted of 50 (75.8%) males and 16 (24.2%) females. The 40-59 years age group constituted 73% of the patient population [Table 1]. Intracerebral hemorrhage (78.8%) and large cerebral infarction (21.2%) were the subtypes seen with respective case fatalities of 69.7% and 13.6% at 4 weeks [Table 1]. The males had the highest sex-specific mortality of 68.2%, while the 40-59 years age group had the highest age-specific mortality of 65.2% as shown in Table 2.

Table 1: Stroke sub-types, age, and sex of distribution of patients

Variable	Sex number (%)		Total
	Males 50 (75.8)	Females 16 (24.2)	66 (100)
Age group in years			
≤ 39	7 (10.6)	0 (0.0)	7 (10.6)
40-59	36 (54.6)	12 (18.1)	48 (72.7)
≥ 60	7 (10.6)	4 (6.1)	11 (16.7)
Stroke-subtype			
Intracerebral hemorrhage	43 (65.2)	9 (13.6)	52 (78.8)
Large cerebral infarction	7 (10.6)	7 (10.6)	14 (21.2)

Table 2: Case fatality according to stroke sub-types, age, and sex

Variable	Sex number (%)		Total
	Male 45 (68.2)	Female 10 (15.1)	55 (83.3)
Age group in years			
≤ 39	2 (3.0)	0 (0.0)	2 (3.0)
40-59	37 (56.1)	6 (9.1)	43 (65.2)
≥ 60	6(9.1)	4 (6.0)	10 (15.1)
Stroke sub-type			
Intracerebral hemorrhage	43 (65.2)	3 (4.5)	46 (69.7)
Large cerebral infarction	2 (3.0)	7 (10.6)	9 (13.6)

Table 3: Functional status of survivors

Stroke types	Number of patients	Number of survivors	Case survival rate (%)	Functional status			
				Vegetative state (%)	Severe disability (%)	Mild/ moderate disability (%)	No disability (%)
Intracerebral hemorrhage	52	6	9.1	0 (0.0)	6 (9.1)	0 (0.0)	0 (0.0)
Large cerebral infarction	14	5	7.6	1 (1.5)	3 (4.6)	1(1.5)	0 (0.0)
Functional survival rates (%)	66	11	16.7	1 (1.5)	9 (13.7)	1 (1.5)	0 (0.0)

Of the 11 (16.7%) patients who survived, none recovered without disability. Nine of them (13.7%) had severe residual disability; one (1.5%) was in vegetative state, while the other (1.5%) recovered with mild disability [Table 3]. Patients with intracerebral hemorrhage became unconscious faster (0.7 ± 0.2 days) than those with large cerebral infarction (1.8 ± 2.0 days) ($P < 0.05$), and the duration of coma before outcome (mainly death) was also shorter in the former (6.0 ± 7.8 days) than the latter (9.1 ± 7.2 days) ($P > 0.05$), although the time of presentation to UCH after coma was not significantly different between the sub-types.

Multiple response analyses of risk factors and co-morbidities revealed that while systemic hypertension was present in all the patients; obesity, alcohol and substance abuse, and DM were documented in 18%, 16.6%, and 13.6% patients, respectively. The co-morbidities were aspiration pneumonia (54.5%), recurrent seizures (16.5%), hyperglycemia (15%), sepsis (12%), urinary tract infection (9%), acute pulmonary edema (7.5%), acute renal failure (6%), and recurrent stroke (4.5%). When subjected to multiple regression analysis, the following factors were associated with poor outcome: - age > 39 years (r =0.432, $P < 0.001$), male gender (r = 0.326, $P < 0.001$), duration of stroke before onset of coma (r = 0.371, $P < 0.001$), systemic hypertension (r = 0.549, $P < 0.001$), and presence of co-morbidity (r = 0. 285, $P = 0.03$) [Table 4].

Discussion

In this study, acute stroke constituted more than 30% of medical causes of coma, 1.0% of total hospital admissions, 3.2% of hospital emergencies, and 7.3% of medical deaths. Our results are similar to those reported by some workers in Nigeria and other African countries,[7-11] According to WHO estimates, deaths from stroke in developing (low and middle-income) countries in 2001 accounted for 85.5% of stroke deaths worldwide, and the number of disability-adjusted life years (DALYs), which comprises years of life lost and years lived with disability in these countries was almost seven times that in developed (high-income) countries.[17,18] The phenomenal increase in the incidence of stroke in Nigerian Africans[7-9,19] and in other developing countries has been described as "the Epidemiologic Transition" from infectious and nutritional

Table 4: Determinants of poor outcome

Prognostic variable	Pearson's correlation coefficient (r)	P value	Odd ratio 95% CI
Age > 39 years	0.432	0.00	0.61 (0.1- 0.74)
Male gender	0.326	0.00	0.27 (0.03- 0.45)
Duration of coma before presentation to UCH	0.371	0.00	0.22 (0.01- 0.38)
Stroke sub-type	-0.56	0.38	0.48 (0.6- 1.02)
Presence of co-morbidity	0.285	0.03	0.02 (0.01- 0.08)
Systemic hypertension	0.549	0.00	0.16 (0.1- 0.4)
Coma	-0.122	0.45	0.38 (0.5- 0.9)

UCH = University College Hospital, Ibadan

disease burdens to diseases related to hypertension, high-fat diets, cigarette smoking, and sedentary lifestyles.[20] Males of 40-59 years age group constituted more than 70% of the patient population. *They also* had the highest sex- and age-specific mortality rates of 68.2% and 65.2%, respectively. Male gender and aging are known non-modifiable risk factors for stroke and several non-communicable diseases (NCDs) such as cardiovascular diseases (CVDs), cancers, DM, and chronic obstructive pulmonary disease (COPD).[1,2,5] These diseases are linked by common lifestyle such as diet, physical activity, alcohol, tobacco, and substance abuse.[20,21] The result of this study has re-emphasized the role of systemic hypertension as a significant cause of stroke morbidity and mortality in sub-Saharan Africa[3,7,12-13,17,19,22] and globally.[18,20,23]

Many studies have shown that very high and low systolic BP values are associated with poor outcome, particularly in patients with impaired consciousness.[6,24-26] In Nigeria, BP control rates remain sub-optimal; varying from 42% to 45% in patients receiving care in tertiary hospitals to 30% among the general population and non-compliance has been cited as a major reason for this trend.[27-29] Recognition of the factors that reduce compliance to treatment will enhance measures at BP reduction and prevention of stroke.[30]

Although stroke is said to be the third leading cause of registered deaths in the industrialized countries and, also a major cause of unregistered sudden deaths in many developing countries, the overall case fatality of 83.3% in this study is worrisome. This is because it is eight times higher than the 12% and 19% generally accepted as case fatality

for first-ever stroke within the first 7 days and at 1 month, respectively.[12] Factors such as coma, delayed presentation, metabolic and systemic complications, type of stroke, poor referral system, lack of stroke units, and quality of care may have been responsible. Other significant contributors were co-morbidities especially aspiration pneumonia, recurrent seizures, and hyperglycemia. Aspiration pneumonia could have resulted from forceful oral feeding, improper nasogastric intubation, or positioning of patients during conveyance to hospital. These unfortunate events have been described in an earlier stroke study.[19] Recurrent seizures occurred in 16.5% of the patients, and deaths from it were usually due to asphyxiation, sympathetic over activity, physical exhaustion, and cardiac arrest.[31,32] Admission hyperglycemia was recorded in 15% of the patients, as distinct from 13.6% with history of DM, thus suggesting that reactive hyperglycemia due to a major stress response might have accounted for the worse outcome in these patients rather than pre-existing DM.[33] Complications such as sepsis, urinary tract infection, acute pulmonary edema, and acute renal failure also contributed to increased morbidity and mortality in stroke patients.[34-36] Early stroke recurrence was seen in 4.5% of patients similar to 2-3% reported in Europe.[14]

Conclusions

This study has shown that systemic hypertension, middle and old age, late presentation, male gender, and co-morbidity were important determinants of poor outcome in acute stroke with coma.

References

1. WHO Task Force on Stroke and Other Cerebrovascular Disorders. Report of the WHO Task Force on Stroke and Other Cerebrovascular Disorders: Stroke-1989. Recommendations on stroke prevention, diagnosis and therapy. Stroke. 1989;20:1407-31.
2. Aho K, Harmsen P, Hatano S, Marquardsen J, Smirnov VE, Strasser T, *et al.* Cerebrovascular disease in the community: Results of a WHO collaborative study. Bull World Health Organ 1980;58:113-130.
3. Osuntokun BO. Stroke in the Africans. Afr J Med Med Sci 1977;6:39-53.
4. Danesi M, Okubadejo N, Ojini F. Prevalence of stroke in an urban, mixed-income community in Lagos, Nigeria. Neuroepidemiology 2007;28:216-223.
5. Bonita R. Epidemiology of stroke. Lancet 1997;349:1269-76.
6. Broderick J, Connolly S, Feldmann E, Hanley D, Kase C, Kase C, *et al.* Guidelines for the management of spontaneous intracerebral hemorrhage in adults: 2007 update: A guideline from the American Heart Association/ American Stroke Association Stroke Council, High Blood Pressure Research Council, and the Quality of Care and Outcomes in Research Interdisciplinary Working Group. Circulation 2007;116:e391-413.
7. Ogun SA. Acute stroke mortality at Lagos University Teaching Hospital-a five year review. Nig Q J Hosp Med 2000;10:8-10.
8. Ojini FI, Danesi MA. Pattern of neurological admissions at the Lagos University Teaching Hospital. Nig J Clin Pract 2003;5:38-41.
9. Ojini FI, Ogun SA, Danesi MA. Thirty-day case fatality of stroke at the Lagos University Teaching Hospital. Nig Q J Hosp Med 2004;14:
10. Ogun SA, Adelowo OO, Familoni OB, Jaiyesimi AE, Fakoya EA. Pattern of medical admission at Ogun State University Teaching Hospital-a three year review. West Afr J Med 2000;19:304-7.
11. Adetuyibi A, Akisanya JB, Onadeko BO. Analysis of the causes of death on the medical wards of the University College Hospital, Ibadan over a 14- year period (1960-1973). Trans R Soc Trop Med Hyg 1976;70:466-73.
12. Venables G. Prognosis, outcome and recurrence of stroke. Stroke Series 2002;9:103-5.
13. Ogun SA. Management of ischemic stroke–recent advances. Niger J Clin Pract 2002;5:130-8.
14. Teasdale G, Jennett B. Assessment of impaired consciousness and coma: A practical scale. Lancet 1974;2:81-4.
15. Malik K, Hess DC. Evaluating the comatose patient: Rapid neurologic assessment is key to appropriate management. Postgrad Med 2002;111:38-40, 43-6, 49-50 passim.
16. Fisher CM. The neurological examination of the comatose patient. Acta Neurol Scand 1969;45(suppl 36):1-56.
17. Connor MD, Walker R, Modi G, Warlow CP. The burden of stroke in Black populations in sub-Saharan Africa. Lancet Neurol 2007;6:269-78.
18. Lavados PM, Hennis AJ, Fernandes JG, Medina MT, Legetic B, Hoppe A, *et al.* Stroke epidemiology, prevention and management strategies at regional level: Latin America and the Caribbean. Lancet Neurol 2007;6:362-72.
19. Wahab KW, Sani MU, Samaila AA, Gbadamosi A, Olokoba AB. Stroke at a tertiary medical institution in Northern Nigeria: Patients' profile and predictors of outcome. Sahel Medical J 2007;10:6-10.
20. Yusuf S, Reddy S, Ounpuu S, Anand S. Global burden of cardiovascular diseases: Part 1: General considerations, the epidemiologic transition, risk factors, and impact of urbanization. Circulation 2001;104:2746-53.
21. Doll R, Peto R, Wheatley K, Gray R, Sutherland I, *et al.* Mortality in relation to smoking: 40 years' observations on male British doctors. BMJ 1994;309:901-11.
22. Ogunniyi A, Talabi O. Cerebrovascular complications of hypertension. Niger J Med 2001;10:158-61.
23. Adams HP Jr, Adams RJ, Brott T, del Zoppo GJ, Furlan AJ, Goldstein LB, *et al.* Guidelines for the early management of patients with ischemic stroke: A scientific statement from the stroke council of the American Stroke Association. Stroke 2003;34:1056-83.
24. Leira R, Dávalos A, Silva Y, Gil-Peralta A, Tejada J, Garcia M, *et al.* Early neurologic deterioration in intracerebral hemorrhage: Predictors and associated factors. Neurology 2004;63:461-7.
25. Ojini FI, Okubadejo NU, Ogun SA. Admission blood pressure of stroke patients and its relationship to one-week case fatality- A preliminary study. Nig Q J Hosp Med 2002;12:1-4.
26. Boreas AM, Lodder J, Kessels F, de Leeuw PW, Troost J. Prognostic value of blood pressure in acute stroke. J Hum Hypertens 2002;16:111-6.
27. Isezuo AS, Njoku CH. Blood pressure control among hypertensives managed in a specialized health care setting in Nigeria. Afr J Med Med Sci 2003;32:65-70.
28. Amira CO, Okubadejo NU. Factors influencing non-compliance with antihypertensive drug therapy in Nigerians. Niger Postgrad Med J 2007;14:325-9.
29. Almas A, Hameed A, Ahmed B, Islam M. Compliance to antihypertensive therapy. J Coll Physicians Surg Pak 2006;16:23-6.
30. Strong K, Mathers C, Bonita R. Preventing stroke: Saving lives around the world. Lancet Neurol 2007;6:182-7.
31. Passero S, Rocchi R, Rossi S, Ulivelli M, Vatti G. Seizures after spontaneous supratentorial intracerebral hemorrhage. Epilepsia 2002;43:1175-80.
32. Reith J, Jo´rgensen HS, Nakayama H, Raaschou HO, Olsen TS. Seizures in acute stroke: Predictors and prognostic significance. Stroke 1997;28:1585-9.
33. Capes SE, Hunt D, Maimberg K, Pathak P, Gerstein HC. Stress hyperglycemia and prognosis of stroke in nondiabetic and diabetic patients: A systematic overview. Stroke 2001;32:2426-32.
34. Tsagalis G, Akrivos T, Alevizaki M, Manios E, Theodorakis M, Laggouranis A, *et al.* Long-term prognosis of acute kidney injury after first acute stroke. Clin J Am Soc Nephrol 2009;4:616-22.
35. Xuedong L, Yali L, Bo W, Gang Z, Yongping Y, Zezhong X. Prediction of functional outcome of ischemic stroke patients in northwest China. Clin Neurol Neurosurg 2007;109:571-7.
36. Llewelyn M, Cohen J; International Sepsis Forum. Diagnosis of infection in sepsis. Intensive Care Med 2001;27(Suppl 1):S10-32.