Original Article

Stroke in Developing Countries: Experience at Kano, Northwestern Nigeria

Owolabi L.F[1], Nagoda M[2]

Abstract

Objectives: As no report on the clinical pattern of stroke in Kano is available, we sought to determine the stroke types, the risk factors associated with stroke, reasons for delay presentation, management issues and outcome of stroke in Kano, Northwestern Nigeria.

Methods: In this prospective study, consecutive patients that were admitted to the medical wards of the two tertiary hospitals; Aminu Kano Teaching Hospital (AKTH), Kano and Murtala Muhammad Specialist Hospital, (MMSH) Kano, from June 2008 to June 2010 were recruited in the study. Diagnosis of stroke and its type were determined by clinical and neuroimaging techniques. Risk factor analysis was made based on clinical, laboratory and other relevant investigational data. The case fatality at 24 hours and 7 days were recorded. The survivors were followed in neurology clinics for 6 months; status of disability on admission and at discharge was recorded using modified Rankin disability scale.

Results: Over a period of 3 years, a total of 273 comprising 179 males and 94 females (m: f = 2:1) stroke patients were recruited. Their age ranged between 18 and 90 with a mean age of 55 yrs (sd-16.5) but the mean age was 52 (s.d =17.6) in males and 60 (s.d= 11.5) in females. The peak age was in the seventh decade. One hundred and seventy four (63.7%) had infarctive stroke while ninety nine (36.3%) had haemorhagic stroke (91 intracerebral and 8 subarachnoid haemorhage). Reasons for the delay included delay referral from private hospital (49.1%), visit to traditional homes before coming to hospital (10.6%), treatment at home (7%), transportation problem (32.2%) and others (1.1%). Overall one hundred and seventy one (63%) survived and one hundred and two (37%) died. The case fatality for stroke was 10% in the first 24 hours and 22% at 7 days.

Conclusion: The clinical pattern and outcome of stroke found in this study are similar to that reported in other geopolitical zones of Nigeria and other developing countries.

Keywords: haemorhagic, intracerebral, infarctive.

Stroke is associated with substantial economic, social and medical problems all over the world.

The incidence of stroke is increasing worldwide and it is the third leading cause of death in most industrialized countries[1-3]. The frequency of stroke in hospital populations in Nigeria varied from 0.9% to 4.0%[4, 5]. Stroke has also been reported, in various studies in Nigeria, to be the commonest cause of neurological admissions[6-8]. At the Aminu Kano Teaching Hospital (AKTH) Kano, stroke accounted for 77.6% of neurological admissions.

1. Neurology unit, Department of Medicine, Aminu Kano Teaching Hospital, Bayero University Kano.
2. Department of Medicine, Murtala Muhammad Specialist Hospital Kano, Nigeria.
E mail: drlukmanowolabi@yahoo.com

At the University College Hospital (UCH) Ibadan, LUTH, and OSUTH, stroke accounted, respectively, for 5%, 8%, and 17% of medical deaths[6–9].

The frequency of ischemic, hemorrhagic and their respective etiologies also vary in different regions of the world[10-12]. In Nigeria, previous reports showed that infarctive stroke is commoner than hemorrhagic stroke (64% and 25% respectively)[5], however, a changing pattern with an increasing frequency of hemorrhagic stroke has been suspected[6,9].

Considering the large population of Kano, which incidentally is the largest in Nigeria[13], by projection, absolute number of stroke cases in the state is likely huge, likewise its numerous consequences including physical disability, death, psychological, social and

economical burden. These consequences do not only affect the individual or his/her family but also society as a whole. Moreover, contrary to what was obtained in the other geopolitical zones of the country, data on stroke in northwestern Nigeria is scarce. It was against this background that we carried out this multicenter prospective study aimed at reviewing the pattern, types, and case fatality of stroke in Kano in Northwestern part of Nigeria.

Methods:

In this prospective study, consecutive patients that were admitted to the medical wards of the two tertiary hospitals; Aminu Kano Teaching Hospital (AKTH), Kano and Murtala Muhammad Specialist Hospital, (MMSH) Kano, from June 2008 to June 2010 were recruited for the study. Eligibility for the study was in accordance with the World Health Organization (WHO) definition of stroke as 'a rapidly developing clinical signs of focal (or global) disturbance of cerebral function, with symptoms lasting 24 hours or longer or leading to death, with no apparent cause other than vascular origin' (WHO 1989)[14]. All the patients enrolled were assessed by clinicians experienced in the subtlety of stroke diagnosis, typing and management. Laboratory investigations like random blood sugar (RBS), full blood count (FBC), retroviral screening (RVS), electrolyte, urea, creatinine, etc. were done. Classification of stroke into haemorhagic and infarctive stroke was based on computerized tomography of the brain (CT Brain) or magnetic resonance imaging (MRI). The World Health Organization criteria with diagnostic accuracy of 71% were also used in some patients[15].

A questionnaire was designed to extract relevant clinical data from the patients. The questionnaire recorded the age, sex, date of admission, delay before presentation, reasons for delay, accompanying symptoms, stroke type, predisposing factors and in some cases, time of death. Only those who had complete information and met the World Health Organization criteria for the clinical diagnosis of stroke were included. The survivors were followed in neurology clinics for six months; status of disability on admission and at discharge was recorded using modified Rankin disability scale[16].

Management of the patients in these centers was in accordance with Aminu Kano Teaching Hospital guideline on stroke management which is a modification of American Heart Association /American stroke association (AHA/ASA) guidelines[17] and more recently Nigerian stroke guidelines[18].

The case fatality at 24 hours and 7 days were recorded. Analysis of data was done using the statistical software package SPSS version16. Descriptive statistics were depicted using absolute numbers, simple percentages, range, and measures of central tendency (mean, median) as appropriate. The Chi-square test was used to test the significance of associations between categorical groups. Statistical significance was fixed at probability level of 0.05 or less.

Results

Over a period of three years, a total of 273 patients comprising 179 males and 94 females (2:1) stroke patients were recruited. Their age ranged between 18 to 90 years with a mean age of 55 years (SD-16.5) but the mean age was 52 (SD =17.6) in males and 60 (SD = 11.5) in females. The peak age was in the seventh decade. Ninety nine (36.3%) patients had computerized tomography of the brain (CT Brain) while six (2.2%) had magnetic resonance imaging (MRI).Out of those that had neuroimaging only 32 (32.3%)were able to do it within 24 hrs.

One hundred and seventy four (63.7%) had infarctive stroke while ninety nine (36.3%) had hemorrhagic stroke (91 intracerebral and 8 subarachnoid hemorrhage).

Table 1 showed distribution of stroke type across sex and age group. Only seventy nine (28.9%) of the patients presented to accident and emergency within the first 6 hours of onset of stroke, out of which only eight (10.1%) were infarctive stroke (Table 2).

Table1. Distribution stroke type and sex by age group

Age group	Infarctive		Haemorhagic		Total
	Male	Female	Male	Female	
<20	3	1	-	-	4
21-30	18	1	9	2	30
31-40	15	9	20	6	50
41-50	12	9	6	-	27
51-60	16	20	15	3	54
61-70	31	16	4	12	63
71-80	12	6	12	9	39
81-90	6	-	-	-	6
Total	113	62	66	32	273

Reasons for the delay included delay referral from private hospital (49.1%), visit to traditional homes before coming to hospital (10.6%), treatment at home (7%), transportation problem (32.2%) and others (1.1%). The traditional risk factors identified are as shown in table 3. One hundred and ninety six (71.8%) belong to low socio-economic class.

Overall one hundred and seventy one (63%) survived and one hundred and two (37%) died. The case fatality for stroke was 10% in the first 24 hours and 22% at 7 days. Out of those that died aspiration pneumonitis was documented in 30% of them as associated cause of death. Median hospital stay was 19 days.

One hundred and six (62%) of the survivors

Table2. Delay before presentation in hours.

Delay before presentation (Hours)	Frequency	Percent
<3	55	20.1
3-6	24	8.8
7-24	121	44.3
25-48	70	25.6
>48	3	1.1
Total	273	100

were seen on follow up six months after the onset of stroke, the investigators recorded only 10 cases of reported death at home. Table 4 showed status of patients on discharge and at six month follow-up.

Table3. Traditional risk factors*

Risk factors	Frequency	Percentage
Hypertension	222	81.3
Smoking	96	35.2
Previous stroke and or transient ischaemic attack	60	22
Diabetes	47	17.2
Hypercholesterolemia	46	16.9
Cardiac diseases	12	4.4
Alcohol	6	2.2
HIV	6	2.2
Migraine	6	2.2
Drug of addiction(cocaine,amphetamine)	3	1.1
Connective tissue disease	3	1.1
Unidentified	14	5.1

*Some patients had multiple risk factors
**Non hypertensive heart diseases (rheumatic and non rheumatic valvular heart diseases)

Table4. Status of patients on modified Ranking scale on discharge and at 6-month follow-up

Ranking disability scale	Frequency at discharge from hospital	Frequency at 6 months follow-up
0 (no symptoms)	-	5
1 (no significant disability)	3	15
2 (slight disability)	27	50
3 (moderate disability)	69	12
4 (moderately severe disability)	54	14
5 (severe disability)	18	10
Total	171	106

Discussion

Recognizing the limitations of hospital-based study, we report our findings in a multicenter prospective study of two hundred and seventy three consecutive stroke patients seen in Kano, Northwestern Nigeria over a three-year period.

One hundred and five of these patients had brain neuroimaging, which was an advantage for stroke diagnosis and classification, compared to those settings where such a diagnostic facility was either not available or was not applied so frequently as in this study.

The male preponderance in this study is similar to the findings in other studies amongst Africans and non-African populations [12, 19-23]. However, some Iranian studies had reported female preponderance[24,25]. Male preponderance in this study may be due to differences in certain risk factors such as smoking which are more prevalent among men in Nigeria. The mean age of the patients in this study is similar to that reported by Bwala in northeastern Nigeria but lower than that quoted in reports from southwestern Nigeria[4,19,26] Majority of stroke patients in this study belong to low socio-economic class, this finding is similar to reports from elsewhere[12,20,21,23,25]. Low socio-economic status is associated with atherosclerosis but this may be primarily mediated by higher burden of risk factors including smoking, high blood pressure, heavy alcohol consumption and diet[27,28].

Ischemic stroke accounted for 64%, whereas hemorrhagic stroke accounted for 36%, this finding is in keeping with the finding of

Bwala (63%) in Northeastern Nigeria[19], Nwosu (65.7%) in South eastern Nigeria[29], Oshuntokun et al (71%) in south western[5] and Onwuchekwa et al (67.3%) in south southern Nigeria[30] as well as reports from studies outside Nigeria[20,21,23,25, 27,28].

However, this finding is at variance with report from retrospective study from a tertiary hospital in Shagamu, Southwestern Nigeria which showed an increasing proportion of hemorrhagic stroke[9].

Regarding risk factors, as previously reported by other studies[31, 32], in the present study, hypertension appeared to be the single most important modifiable risk factor for both ischaemic and haemorhagic stroke, followed by smoking, previous TIA and or stroke, hypercholesterolemia, cardiac diseases and HIV respectively either alone or in combination in the majority of our patients. Only in 5.1% of our cases, could no risk factors be detected.

Quite disturbing is the fact that majority of these patients with hypertension were unaware of their condition until they develop stroke. Thus, a very logical approach to primary prevention of stroke will be to ensure good control of blood pressure in hypertensive patients. Also of note among the findings in this study is the relatively high level of cholesterol among stroke patients, this is in conformity with report of Karaye et al in AKTH, Kano[33].

Six of our patients that consented to HIV screening were reactive; HIV is increasingly becoming a common risk factor for stroke in

Sub-Saharan Africa[34-39] where it has been shown to be associated with coagulation abnormalities, such as protein S deficiency. Mochan et al.[36] found the causes of stroke in HIV-positive stroke patients to be similar to those in HIV negative stroke patients.

Whether HIV by itself actually causes or independently increases the risk of stroke has been a recurrent question. It causes an intracranial small vessel vasculopathy[36], and extra-cranial large artery [vasculitis33, 34]. A study has fairly convincingly found HIV to be an independent risk for stroke[39].

In the present study, less than one-third of the patients presented in the first six hours which incidentally is the time window for thrombolytic therapy, this finding has significant implication for thrombolytic therapy in the management of infarctive stroke in our setting. The number of stroke patients receiving r-tPA in the third world is extremely low [40]. Thrombolytic therapy for infarctive stroke is not received in our center like other centers in Nigeria. Stroke thrombolysis is currently used in few developing countries like Brazil, Argentina, Senegal, Iran, Pakistan, China, Thailand, and India[40]. One of the most important prehospital barriers of thrombolysis therapy in the developing world is prehospital delay. Other barrier to thrombolytic therapy in developing countries includes financial constraints, and lack of infrastructures. Until a cheaper thrombolytic agent and the proper infrastructure for utilization of thrombolytic therapy is available, developing countries should focus on primary and secondary stroke prevention strategies[41]. This again emphasizes the need for governments and health systems of developing countries to begin to take action towards developing and promoting infrastructure of stroke care. It is also essential to intensify efforts on stroke awareness among the populace.

Mortality and case fatality in the present study are comparable to what was reported in the other geopolitical zones of Nigeria[4,19, 26, 30]. Aspiration pneumonitis being a common finding associated with death is worthy of note, this is in conformity with a study by Hassan et al reported that 23% of patients with stroke developed stroke associated pneumonia, of which 34% died during hospital stay[42,43].

Regarding disability in survivors, comparing degree of disability at discharge to disability at six month follow-up some improvement was recorded. This can be largely ascribed to intensive qualitative physiotherapy and secondary prevention of stroke. However, some of the patients lost to follow-up could be as a result of unreported death at home.

In order to reduce the incidence, mortality and morbidity associated with stroke, effort should be geared towards developing robust screening and control programs on hypertension. Moreover, health education with emphasis on control of other predisposing factors such as diabetes mellitus, avoidance of smoking and fatty foods as well as primary prevention of HIV should be embarked upon.

Conclusion

Stroke is a common neurological disorder in Kano, northwestern Nigeria and the pattern of stroke subtypes, profile of risk factors and outcome of stroke are similar to those reported in other geopolitical zones of Nigeria and other developing countries.

References

1. Sudlow CLM, Warlow CP. Comparing stroke incidence worldwide: what makes studies comparable? Stroke. 1996; 27: 550–558.
2. Wolf PA, Kannel WB, Dawber TR. Prospective investigations: the Framingham study and the epidemiology of stroke. Adv Neurol. 1978; 19: 107–120.
3. Warlow, C.P. Epidemiology of stroke. Lancet. 1998; 352 (suppl 3): SIII1–SIII4.
4. Ogun SA, Ojini FI, Ogungbo B et al. Stroke in south west Nigeria: a 10-year review. Stroke 2005;36: 1120-2.
5. Osuntokun BO, Bademosi O, Akinkugbe OO B et al. Incidence of stroke in an African City: results from the Stroke Registry Ibadan, Nigeria, 1973–1975 Stroke. 1979; 10: 205–207.
6. Ogun, S.A. Acute stroke Mortality at Lagos University Teaching Hospital—a five year review. Nig Q J Hosp Med. 2000; 10: 8–10.
7. Ojini FI, Danesi MA. Pattern of neurological admissions at the Lagos University Teaching Hospital. Nig J Clin Pract. 2003; 5: 38–41.

8. Talabi OA. A 3-year review of neurologic admissions in University College Hospital Ibadan, Nigeria. West Afr J Med 2003; 22:150-1.

9. Ogun, SA, Adelowo OO, Familoni OB B et al. Pattern of medical admission at Ogun State University Teaching Hospital—A three year review. W Afr J Med. 2000; 19: 304–307.

10. Matsumoto N, Whisnant JP, Kurland LT B et al. Natural history of stroke in Rochester, Minnesota, 1955 through 1969: an extension of a previous study, 1945 through 1954.Stroke 1973; 4: 20-29.

11. Jain S, Maheshwari MC. Cerebrovascular diseases: a review of the Indian experience in the last 35 years. Neuroepidemiology 1986; 5: 1-16.

12. Viriyavejakul A. Stroke in Asia: an epidemiological consideration. Clinical Neuropharmacol 1990; 13 (3): S26-33.

13. National Population Commission. List of Nigerian State by Population. Federal republic of Nigeria Census; 2006

14. World Health Organization. Recommendations on stroke prevention, diagnosis, and therapy. Report of the WHO Task Force on Stroke and other Cerebrovascular Disorders. Stroke 1989; 20: 1407-1431.

15. Aho K, Harmsen P, Hatano S B et al. CVD in the community: results of a WHO collaborative study. Bull WHO. 1980; 58: 113–130

16. Uyttenboogaart M, Luijckx GJ, Vroomen PC B et al. Measuring disability in stroke: relationship between the modified Rankin scale and the Barthel index. Journal of Neurology.2007;254 (8): 1113-1117

17. Harold P.etal Guidelines for the early management of adults with ischemic stroke Stroke. 2007; 38: 1655-1711

18. Ogun SA, Danesi MA et al Nigeria stroke society (NSS) guideline for prevention and management prevention of stroke 2009, NSNS 2011 pp 1-22

19. Bwala, S. A. "Stroke in a subsaharan Nigerian hospital--a retrospective study. Trop Doct 1989; 19(1): 11- 4.

20. Massaro A. R., "Stroke in Brazil: a South America perspective," International Journal of Stroke, 2006; 1(2) 113–115,

21. Nicoletti A., Sofia V., Giuffrida S.et al., "Prevalence of stroke: a door-to-door survey in rural Bolivia," Stroke 2000; 31(4): 882–885.

22. Sacco RL, Boden-Albala B, Gan R et al. Stroke incidence among white,black, and Hispanic residents of an urban community: the Northern Manhattan Stroke Study. Am J Epidemiol 1998;147:259-268.

23. Warlow CP. Epidemiology of stroke. Lancet 1998; 352 :1-4.

24. Ghandehari K., Pourzahed A., Taheri M.et al., "Estimation of Iranian stroke patients eligible for intravenous thrombolysis with tPA," International Journal of Stroke 2009; 4(4): 236.

25. Ghandehari K.and Izadi Mood Z. "Cardioembolic strokes in Eastern Iran and the importance of rheumatic valvular disease," Turkish Journal of Medical Sciences 2006; 36(6): 361–364.

26. Komolafe, M. A., Ogunlade O.and Komolafe E Ol. "Stroke mortality in a teaching hospital in South Western Nigeria." Trop Doct 37(3): 186-8.

27. Truelsen T, Bonita R, Jamrozik K. Surveillance of stroke: a global perspective. Intern J Epi 2001; 30: S11-16

28. Truelsen T. Experience from the Mumbai Stroke Register. Neuroepidemiology 2008; 31: 262-3

29.Nwosu, C. M., A. C. Nwabueze, et al. "Stroke at the prime of life: a study of Nigerian Africans between the ages of 16 and 45 years." East Afr Med J 1992; 69(7): 384-90.

30. Onwuchewa, A., H. Bellgam, Asekomeh G. "Stroke at the university of port harcourt teaching hospital, rivers state, Nigeria." Trop Doct 2009;39(3): 150-2.

31. Dyken M, Wolf PA, Bernette JHM et al. Risk factors in stroke. Stroke 1984; 15: 1105-1111.

32. Wolf PA, Kannel WB, Verter J. Current status of risk factors for stroke. Neurol Clin 1983; 1: 317-343.

33. Karaye, K. M., Nashabaru I., Fika GM et al. (2007). "Prevalence of traditional cardiovascular risk factors among Nigerians with stroke." Cardiovasc J Afr 18(5): 290-4.

34. Connor MD, Lammie GA, Bell JE B et al. Cerebral infarction in adult AIDS patients. Stroke. 2000;31:2117–2126.AIDS Patients: Observations from the Edinburgh HIV Autopsy Cohort. Stroke 2000;31:2117-2126.

35. Mochan A, Modi M, Modi G. Stroke in black South African HIV-positive patients: a prospective analysis. Stroke 2003;34: 10-15.

36. Nair R, Robbs JV, Chetty R B et al. Occlusive arterial disease in HIV-infected patients:a preliminary report. Eur J Vasc Endovasc Surg 2000;20:353-357.

37. Chetty R. Vasculitides associated with HIV infection. J Clin Pathol 2001; 54: 275-278.

38. Cole JW, Pinto AN, Hebel JRet al. Acquired immunodeficiency syndrome and the risk of stroke. Stroke 2004;35:51-56.

39. Pandian JD, Padma V, Vijaya P B et al. "Stroke and thrombolysis in developing countries," International Journal of Stroke 2007; 2(1): 17–26

40. Kavian Ghandehari. Barriers of Thrombolysis Therapy in Developing Countries. Stroke Research and Treatment 2011;10:1- 4

41. Bhojo A K, Bilal H, Uzma UM. Stroke in Pakistan J Pak Med Assoc 2008;58(7):400-403

42. Hassan A, Khealani BA, Shafqat S, Aslam M, Salahuddin N, Syed NA, et al.Stroke associated pneumonia: microbiologic data and outcome. Singapore Med J 2006;47:204-07.