Correlation of Admission Blood Pressures with 30-Day Outcome in Acute Ischaemic Stroke in Nigerians.

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SUMMARY

Background: There is a lot of controversy on the prognostic value of admission blood pressures in acute ischaemic stroke, but in Nigeria, there is no information on this.

Objective: The objective of this study was to correlate the effect of blood pressures measured on admission with 30-day mortality and neurological handicap in Nigerians with acute ischaemic stroke.

Methods: This was a prospective observational study carried out between February, 2003 and May, 2004 at the Lagos University Teaching Hospital, Lagos, Nigeria. All eligible consecutively consenting ischaemic stroke patients were recruited. Systolic (SBP) and diastolic blood pressures (DBP) were measured on admission while pulse pressure (PP) and mean arterial pressure (MAP) were derived. Patients were periodically evaluated for progress and/or development of complications. Primary outcome was mortality within 30 days while secondary outcome was level of handicap on the modified Rankin Scale.

Results: 100 patients were studied (mean age 58.56±14.12 years); 53% were males. Overall 30-day case fatality rate was 28%. There was no significant correlation between admission blood pressures and 30-day mortality (SBP: r = -0.05, p= 0.62; DBP: r = -0.12, p= 0.23; PP: r = 0.01, p= 0.90; MAP: r = -0.09, p= 0.36) or modified Rankin Score (SBP: r = -0.11, p= 0.29; DBP: r = -0.13, p= 0.21; PP: r= -0.06, p= 0.54; MAP: r = -0.13, p= 0.21).

Conclusion: Admission blood pressures do not have significant influence on 30-day mortality and level of handicap in Nigerians with ischaemic stroke.

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INTRODUCTION

Stroke is a leading cause of mortality and long-term disability worldwide with up to one out of every six survivors remaining permanently disabled[1]. In spite of the advances in its care in the developed countries, the challenges of care are still enormous in developing countries where cases are still mostly managed by general practitioners as a result of dearth of neurologists compared to developed countries where stroke outcome has improved because of the multidisciplinary approach to its management in stroke units.

Age, sex and baseline variables like level of consciousness, stroke severity, hyperglycaemia and presence of complications have been shown to influence outcome in acute ischaemic stroke[2-8]. Although as high as 80% of patients with ischaemic stroke are hypertensive on admission[1], there is a lot of controversy on its management in this acute phase and also its effect on morbidity and mortality. In Nigeria, where up to two out of every five stroke cases die[9], there is no information on the effect of admission blood pressure on outcome. This study was designed to correlate admission blood pressures namely: systolic, diastolic and pulse pressures as well as mean arterial pressure with short-term mortality and functional outcome in Nigerians with first acute ischaemic stroke. This is to compare the findings in Nigeria, a developing country where stroke management is still largely conservative, with findings from other parts of the world and make appropriate recommendations that will impart positively on the management of our patients in order to reduce mortality and morbidity.

METHODS

Patients presenting to the emergency medical unit of the Lagos University Teaching Hospital, Lagos, Nigeria between February, 2003 and May, 2004 with a diagnosis of stroke as defined by the World Health Organization (WHO)[10] were prospectively recruited after an informed consent from either the patient or a proxy. The research protocol was approved by the research and ethics committee of the hospital. The inclusion criteria for the study were first ever stroke, presentation within 72 hours and ischaemic stroke confirmed by brain CT scan or satisfaction of the Siriraj Stroke Score criteria for ischaemic stroke in those who could not afford a CT; the latter has been shown to have a predictive accuracy of 80% in Nigerians[11].

Detailed information was obtained on admission in a standardized manner with the aid of a structured questionnaire. As part of the detailed evaluation in the emergency room, the blood pressure of each patient was measured in the left arm in supine position with Accoson® mercury sphygmomanometer using the appropriate-sized cuff. The systolic BP was recorded at phase I Korotkoff sounds while the diastolic BP was recorded

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at phase V Korotkoff sounds or at phase IV Korotkoff sounds when the difference between phase IV and phase V is more than 10mmHg. The BP was measured twice, and the mean of the two values was taken as the admission blood pressure of the patient .Pulse pressure was obtained from the difference between systolic and diastolic blood pressures while the mean arterial pressure was derived by adding 1/3 of the pulse pressure to the diastolic blood pressure. Stroke severity on admission was assessed with the National Institute of Health Stroke Scale (NIHSS): a score >13 was used to define severe stroke[5], while baseline handicap was assessed with the use of the modified Rankin Scale: a score =3 was used to define major handicap[8].

Venous samples were also collected for necessary investigations. All patients were managed conservatively with no intervention in the BP for the first 14 days from stroke onset except two cases that had acute left ventricular failure and had to be commenced on antihypertensives during the acute stage; these were excluded from the final analysis. The primary outcome was mortality within 30 days while functional outcome on the modified Rankin Scale was used as the secondary outcome measure.

Statistics

Data was analyzed with the Statistical Package for the Social Sciences (SPSS®) version 11.0. Frequency tables were generated while means and standard deviations were calculated. Categorical variables were compared with the Chi-square test while means were compared with the use of ANOVA. Pearson's correlation coefficient was determined to test the correlation of various admission BPs with 30-day mortality and level of handicap on the modified Rankin scale. Statistical significance was taken as a p-value <0.05.

RESULTS

Table 1 shows the demographic and baseline characteristics of the patients. One hundred patients were studied with an overall mean age of 58.6 years. There were 53 males with mean ages of 56.0 and 61.5 years for males and females respectively. Stroke was severe (NIHSS >13) in 37.7% of males compared to 31.9% of females, while 75.5% males compared to 72.3% females had major handicap (MRS =3) on admission. History of diabetes mellitus (DM) was more common in females compared to males, while 35.8% of males compared to 31.9% of females had admission hyperglycaemia. Overall the mean SBP was 163.7 mmHg. Males had a higher mean SBP (165.6 vs 161.6 mmHg, p>0.05) and DBP (100.3 vs 92.9 mmHg, p<0.05). There was no statistically significant difference in the PP and MAP between the two sexes.

Primary outcome

The overall 30-day case fatality rate was 28% with no statistically significant difference in the case fatality rate between males and females (28.3% vs 27.7%). This is shown in table 1. As shown in table 2, there was no significant correlation between the admission BPs and 30-day mortality.

Secondary outcome

As shown in table 1, 25% of the patients had a major handicap (MRS =3) by the 30th day. Although 26.4% of the male patients had a major handicap compared to 23.4% of females, this was not statistically significant. Admission BPs poorly correlated with the level of handicap on the modified Rankin scale by the 30th day (table 2).

Table 1: Demographic and baseline characteristics of subjects

Variable	Overall (n=100)	Male (n=53)	Female (n=47)	p value Male vs Female
Age ± SD, yrs	58.6±14.1	56.0±14.0	61.5±13.8	0.05
NIHSS, n (%)				
≤13	65 (65.0)	33 (62.3)	32 (68.1)	0.54
>13	35 (35.0)	20 (37.7)	15 (31.9)	
Admission mRS, n (%)				
<3	26 (26.0)	13 (24.5)	13 (27.7)	0.72
≥3	74 (74.0)	40 (75.5)	34 (72.3)	
History of DM, n (%)	23 (23.0)	10 (18.9)	13 (27.7)	0.30
Blood Glucose, mg/dl, n(%)				
<140	66 (66.0)	34 (64.2)	32 (68.1)	0.68
≥140	34 (34.0)	19 (35.8)	15 (31.9)	
Mean SBP±SD, mmHg	163.7±31.9	165.6±28.3	161.6±35.7	0.53
Mean DBP±SD, mmHg	96.8±15.8	100.3±13.6	92.9±17.3	0.02
Mean PP±SD, mmHg	67.0±23.1	65.4±20.8	68.7±25.5	0.47
MAP±SD, mmHg	119.1±19.7	122.1±17.2	115.8±21.9	0.11
Outcome at 30 days				
Dead	28 (28.0)	15 (28.3)	13 (27.7)	0.94
mRS≥3	25 (25.0)	14 (26.4)	11 (23.4)	0.73

Table 2: Correlation of admission blood pressures with 30-day outcome

Variable	Mortality		Modified Rankin Score	
	r	p value	r	p value
Systolic blood pressure	-0.05	0.62	-0.11	0.29
Diastolic blood pressure	-0.12	0.23	-0.13	0.21
Pulse pressure	0.01	0.90	-0.06	0.54
Mean arterial pressure	-0.09	0.36	-0.13	0.21

r = Pearson's correlation coefficient

DISCUSSION

From the authors' personal observations, many stroke cases in Nigeria are first managed by general practitioners before being transferred to tertiary centres if there is no improvement in the patients' clinical condition. At these tertiary institutions, it is common to see cases that have had their blood pressures drastically reduced minutes or few hours after stroke (sometimes with parenteral antihypertensive drugs) before referral. This observational study found no correlation between admission blood pressures (i.e. systolic, diastolic, pulse and mean arterial pressures) and short-term outcome in terms of mortality and neurological handicap on the modified Rankin scale after acute ischaemic stroke in Nigerians. These findings are comparable to those of Abboud et al[12] who studied 230 consecutive patients admitted within the first 24 hours of ischaemic stroke onset and found that admission blood pressure was not significantly associated with total deaths or deaths related to cardiovascular events. Their study however found that this relationship was

dependent on the severity of stroke on presentation. In a similar observational study like ours by Castillo et al[13] , a U-shaped relationship was found between admission BP and outcome. In that study, those whose BPs were lowered in the first day after stroke had a poor outcome in terms of early neurological deterioration, infarct volume and neurological deficit at 90 days independent of other prognostic factors like stroke severity.

The findings are however different from those of Leonardi-Bee et al[14] who concluded from the International Stroke Trial that both high and low BPs are independent predictors of poor outcome. They observed though, that this relationship appeared to be mediated in part by increased rates of early recurrence and death resulting from presumed cerebral edema in those with high BP, and increased coronary heart disease events in those with low BP. Recurrence and coronary heart disease events were however not assessed in our study. Also, Carlberg et al[15] found a significant relationship between high BP on admission and 30-day mortality but this was only true for patients with impaired consciousness.

Up to 80% of all patients with ischaemic stroke are hypertensive on admission[1], though the BP falls spontaneously in the subsequent 10 to 14 days[16], with only about 40% remaining hypertensive[17] . Control of BP in this acute phase is usually an enigma. The possible reasons for the observed hypertension are preexisting hypertension which could be the risk factor for the stroke, a breakdown of the cerebral autoregulatory mechanism following the event, stress of the stroke, a physiological response to hypoxia, a full bladder, and possible cerebral edema with raised intracranial pressure manifesting as Cushing's reflex especially in those with large hemispheric infarctions presenting days after ictus[18-20].

As this study found no correlation between admission BPs and short-term outcome, it is recommended that the standard guidelines[1] on management of BP in ischaemic stroke should be followed. Cerebral blood flow is dependent on the cerebral perfusion pressure and cerebrovascular resistance. Following acute ischaemic stroke, there is a breakdown of the cerebral autoregulatory mechanism and perfusion of the penumbra area of the brain through collateral vessels is maintained by elevated arterial pressure. It therefore follows that any reduction in the arterial pressure at this stage may be deleterious to the patient because it will reduce cerebral perfusion. It is generally recommended that blood pressure should not be lowered in the first 10 days after ischaemic stroke onset except it is repeatedly >200-220 mmHg systolic or >120 mmHg diastolic, the patient has malignant hypertension, hypertensive encephalopathy, dissecting aneurysm of the aorta or other cardiovascular emergencies e.g. acute left ventricular failure[1,20] as found in two of our patients. Before treating hypertension, possibility of cerebral edema with raised intracranial pressure and Cushing's reflex should always be considered (especially in patients with large hemispheric infarcts), and if present, such patients should have cerebral decompression with an agent like 20% mannitol given intravenously.

Some of the limitations of this study are its observational nature which means that the results may not be totally generalizable as it has not shown any cause-effect relationship. The second limitation is the small sample size which is likely to increase the possibility of type 2 error. It however largely achieved the aim of correlating the effect of admission BPs with short-term outcome in Nigerians with acute ischaemic stroke. The findings will serve as a guide for physicians on the management of BP in the acute phase of ischaemic stroke. A prospective multicentred case-control study with a larger sample size is advocated so as to establish if there is any cause-effect relationship between admission BPs and short-term outcome in Nigerians.

REFERENCES

1. Klijn C. J. M., Hankey G. J. Management of acute ischaemic stroke: new guidelines from the American Stroke Association and European Stroke Initiative. *Lancet Neurol* 2003; **2:** 698 – 701
2. Uchino K., Billheimer D., Cramer S. C. Entry criteria and baseline characteristics predict outcome in acute stroke trials. *Stroke* 2001; **324:** 909 – 16.
3. Bagg S., Pombo A. P., Hopman W. Effect of age on functional outcomes after rehabilitation. *Stroke* 2002; **33:** 179 – 185.
4. Henon H., Godefroy O., Leys D., Mounier-Vehier F., Lucas C., Rondepierre P, et al. Early predictors of death and disability after acute cerebral ischaemic event. *Stroke*.1995; **26:** 392 – 398.
5. Muir K. W., Weir C. J., Murray G. D., Povey C., Lees K. R. Comparison of neurological scales and scoring systems for acute stroke prognosis. *Stroke* 1996; **27:** 1817 – 1820.
6. Johnston K. C., Li J. Y., Lyden P. D., Hanson S. K., Feasby T. E., Adams R. J. *et al*. Medical and neurological complications of ischaemic stroke. Experience from the RANTTAS Trial. *Stroke* 1998; **29:** 447 – 453.
7. Williams L. S., Rotich J., Qi R., Fineberg N., Espay A., Bruno A. *et al*. Effects of admission hyperglycaemia on mortality and costs in acute ischaemic stroke. *Neurology* 2002; **59:** 67 – 71.
8. Alvarez-Sabin J., Molina C. A., Montaner J., Arenillas J. F., Huertas R., Ribo M. *et al*. Effects of admission hyperglycaemia on stroke outcome in reperfused tissue plasminogen activator-treated patients. *Stroke.* 2003; 34:1235-1241.
9. Ogun S. A., Ojini F. I., Ogungbo B., Kolapo K. O., Danesi M. A. Stroke in South West Nigeria. A 10-year review. *Stroke* 2005; **36(6):** 1120 – 2.
10. Aho K., Harmsen P., Hatano S., Marquardsen J., Smirnov V. E., Strasser T. Cerebrovascular disease in the community: results of a WHO collaborative study. *Bull World Health Organ*. 1980; **58:** 113 – 130
11. Kolapo K. O., Ogun S. A., Danesi M. A., Osalusi B. S., Odusote K. A. Validation study of the Siriraj Stroke score in African Nigerians and evaluation of the discriminant values of its parameters: a preliminary prospective CT scan study. *Stroke* 2006; **37(8):** 1997 – 2000
12. Abboud H., Labreuche J., Plouin F., Amarenco P., GENIC Investigators. High blood pressure in early acute stroke: a sign of poor outcome? *J Hypertens* 2006; 24(2): 381 – 6.
13. Castillo J., Leira R., Garcia M. M., Serena J., Blanco M., Davalos A. Blood pressure decrease during the acute phase of ischaemic stroke is associated with brain injury and poor stroke outcome. *Stroke* 2004; **35:** 520 – 527.
14. Leonardi-Bee J., Bath P. M. W., Phillips S. J., Sandercock P. A. G., For International Stroke Trial Collaborative Group. Blood pressure and clinical outcomes in the International Stroke Trial. *Stroke* 2002; **33:** 1315 – 1320.

15. Carlberg B., Asplund K., Hagg E. The prognostic value of admission blood pressure in patients with acute stroke. *Stroke* 1993; **24:** 1372 – 1375.
16. Harper G., Fotherby M. D., Panayiotou B. N., Castkeden C. M., Potter J. F. The changes in blood pressure after acute stroke: abolishing the "white coat effect" with 24-h ambulatory monitoring. *J Intern Med* 1994; **235:** 343 – 346.
17. Willmot M., Leonardi-Bee J., Bath P. M. W. High blood pressure in acute stroke and subsequent outcome: a systematic review. *Hypertension* 2004; **43:** 18 – 24.
18. Aslanyan S., Fazekas F., Weir C. J., Horner S., Lees K. R.; For the GAIN International Steering Committee and Investigators. Effect of blood pressure during the acute period of ischaemic stroke on stroke outcome. A tertiary analysis of the GAIN International Trial. *Stroke* 2003; **34:** 2420 – 2425.
19. Phillips S. J. Pathophysiology and management of hypertension in acute ischaemic stroke. *Hypertension* 1994; **23:** 131 – 136
20. Odusote K. Management of stroke. *Nig Med Pract* 1996; **32(5/6):** 54 – 62.