Poststroke Hypertension in Africa

Martin Kaddumukasa, MD; Edward Dumba, MD; Pamela Duncan, PhD, PT; Larry B. Goldstein, MD

Background and Purpose—Little is known about the frequency of hypertension and related knowledge in Africans who have had a stroke. The objective of this study was to determine the frequency of hypertension, its control, and associated knowledge among patients with and without a history of stroke at Uganda’s main referral hospital.

Methods—Subjects with a history of stroke (n=157) were compared with stroke-free control subjects (n=149). Demographics and clinical characteristics were recorded and hypertension-related knowledge assessed by questionnaire. Multiple logistic regression including cases and control subjects was used to determine factors independently associated with blood pressure control and hypertension-related knowledge.

Results—A total of 69.4% of cases versus 54.7% of control subjects were hypertensive at the time of the research visit (P=0.001). Univariable analyses showed the odds of having good blood pressure control (OR, 0.53; 95% CI, 0.33–0.84; P=0.006) and good hypertension knowledge (OR, 0.35; 95% CI, 0.22–0.56; P=0.0001) were lower in cases. Age <40 years (P=0.002), good hypertension-related knowledge (P=0.002), and poorer medication adherence (P=0.0001) were independently associated with poorer blood pressure control. Those with a history of hypertension had better hypertension-related knowledge (P=0.001), but knowledge was poorer among cases (P<0.0001).

Conclusion—Hypertension is common in Ugandans with and without a history of stroke. Barriers to effective blood pressure control in Uganda other than patient knowledge need to be identified. (Stroke. 2012;43:00-00.)

Key Words: Africa ■ case–control ■ hypertension ■ stroke

Stroke-related morbidity and mortality is higher in sub-Saharan Africa than in the developed world. Hypertension is a major stroke risk factor with adequate treatment associated with 35% to 40% reductions in stroke incidence. Hypertension control in sub-Saharan Africa, however, is generally poor. Although patient involvement is critical for achieving adequate blood pressure (BP) control, little is known about Africans’ hypertension-related knowledge. The objectives of this study were to investigate the frequency of hypertension, its control, and associated knowledge among patients with and without a history of stroke attending a Ugandan tertiary care hospital’s outpatient neurology clinic. The primary hypothesis was that the level of BP control in subjects who had a stroke would be associated with their hypertension-related knowledge.

Methods
This study was conducted at Mulago National Referral Hospital in Kampala, Uganda. Cases were identified from neurology records and defined as adults having the abrupt onset of a neurological deficit lasting >24 hours attributable to a vascular cause at least 1 month earlier and confirmed on brain CT scan. Control subjects were stroke-free adult outpatients (70% had infectious diseases). Control subjects were matched to cases by sex and age (±3 years). Patients declining to participate, unable to provide a reliable history, or with missing data (n=5) were excluded.

BP was averaged for 2 recordings (15-minute interval) with an automated sphygmomanometer with the subject seated. Hypertension was defined according to Joint National Committee guidelines (BP ≥140/90 mm Hg). Poor BP control was defined as having a research visit BP ≥140/90 mm Hg among those with a history of hypertension.

A research assistant abstracted the subject’s index stroke type, hypertension history, and chronic diseases from the medical record. Medication adherence, BP knowledge, and lifestyle information were obtained by questionnaire (online-only Data Supplement). Those indicating they never or rarely missed medications were considered adherent.

Subject knowledge was quantified by the number of correct answers in response to hypertension-related questions. Those with ≥75% correct responses were categorized as knowledgeable. Factors independently associated with good BP control and knowledge were identified using multiple logistic regression including both cases and control subjects. Statistical analyses were performed using SPSS Version 11.

The study was approved by the Makerere University Ethics Review Board, the Duke University Institutional Review Board, and Uganda National Council for Science and Technology. All subjects or their legal representative provided written consent.

Results
The average time between the index stroke and the research clinic visit was 24 months. Table 1 gives subject demographic

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From Makerere University, College of Health Sciences, Kampala, Uganda (M.K., E.D.); Wake Forest University, Winston-Salem, NC (P.D.); and Duke University, and the Durham Veterans Affairs Medical Center, Durham, NC (L.B.G.).

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Correspondence to Larry B. Goldstein, MD, Box 3651, Duke University Medical Center, Durham, NC 27710. E-mail larry.goldstein@duke.edu

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and clinical characteristics. Cases were older and more commonly had a history of hypertension, diabetes, and chronic kidney disease and a research visit BP $\geq 140/90$ mm Hg. Cases and control subjects had similar levels of education.

Table 2 compares BP control and knowledge between those with and without a history of stroke. Cases were less likely to have good BP control and had poorer hypertension-related knowledge. Most cases knew the benefits of regular exercises (91.6%) and medication (79.2%) on BP control; however, only 3.9% knew the importance of diet (online-only Data Supplement Figure I). More than 90% of control subjects knew the importance of each. In the entire study population, knowledge of hypertension, its associated symptoms, and BP control increased with increasing levels of education (online-only Data Supplement Figure II). Only 42.2% of cases reported having a BP check in the previous 2 months; overall, 33% did not know whether they had hypertension.

Variables with $P<0.1$ in univariable analyses were included in multivariable models (Table 3). Age <40 years, good hypertension-related knowledge, and poorer medication adherence were independently associated with poorer BP control. A history of hypertension was independently associated with better hypertension-related knowledge, but a history of stroke was associated with poorer knowledge.

**Discussion**

We found the frequency of having a research visit BP $\geq 140/90$ mm Hg was higher in cases (64.9%) than in stroke-free control subjects (54.7%). Both frequencies are much higher than in a previous Ugandan study (30.5%). This may, in part, be due to the advent of “fast foods” in the Ugandan diet. The higher rates in our study might also be attributed to a growing impact of Uganda’s lack of BP education and control programs. If the high frequency of hypertension in our control subjects is similar to the general Ugandan population, strategies aimed at BP control could have a major impact on stroke incidence in the country.

Consistent with other data from sub-Saharan Africa, our subjects had strokes at a young age (mean, 55.8 years) compared with Western populations (mean, 69.3 years in blacks). Lifestyle differences could be a possible explanation. Older individuals may be more likely to make and sustain lifestyle changes, especially regarding diet. Alternatively, older patients in Uganda might not have adopted Western-style diets. We also found that younger patients with hypertension had poorer BP control, likely contributing to their higher stroke risk.

Lack of knowledge about hypertension impedes both primary and secondary prevention. Like in other populations, we found that higher levels of education were associated with better hypertension-related knowledge. Despite similar education, however, our cases had poorer BP control (only 3.9% of cases understood the importance of diet) than control subjects and more commonly had a research visit BP $\geq 140/90$ mm Hg. The reason for poorer dietary knowledge in cases is not clear. Not surprisingly, those with a history of hypertension had better hypertension-related knowledge. Unexpectedly, better hypertension knowledge was independently...
associated with poorer BP control. These observations imply that the impact of knowledge alone on BP control may be outweighed by other barriers and suggest that the problem may need to be addressed through improved education in addition to identification of other factors affecting compliance.9

This study does have limitations. Although conducted at Kampala’s major referral hospital, this was a single-site study, and the results may not be generalizable to other settings in Africa. All studies involving subject questionnaires are subject to recall and other biases. Because CT confirmation was required, patients with small strokes might be excluded and those with severe strokes could not be interviewed or were missed because of the long interval between the stroke and research visit. Despite these limitations, our data suggest that hypertension may be very common in Ugandans with and without a history of stroke. Increased awareness of the impact of hypertension and its control are important public health and clinical goals. To be effective, our data suggest that barriers to treatment other than patient knowledge need to be identified.

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Disclosures
None.

References
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Data Supplement (unedited) at:
http://stroke.ahajournals.org/content/suppl/2012/09/25/STROKEAHA.112.672485.DC1

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SUPPLEMENTAL MATERIAL

Poststroke Hypertension in Africa
Online Figure 1: Blood Pressure Knowledge and Control

Online Figure 2: Education Level and Hypertension-Related Knowledge in Cases and Controls. Education level: Primary, pre-high school; Secondary, high-school; Tertiary, university.
Hypertension Knowledge Questionnaire
Mulago Hospital, Uganda

Date of assessment ____________  Study number ______________

A. Identification (record or circle the appropriate choice)

Date of Births: …../……../ ……..

B. Gender:

1. Male
2. Female

C. Marital status:

1. Single.
2. Married.
3. Divorced / separated.
4. Widowed

D. Living Arrangements:

Whom are you currently living with?

1. Family
2. Alone
3. Friends

E. Occupation:

1. Employed
2. Unemployed
3. Student
4. Peasant
5. Other specify ..............................................
F. Highest Education level attained: …………
   1 No education
   2 Primary
   3 Secondary
   4 Tertiary

G. Previous stroke History

1) Have you had a stroke?
   1 N
   2 Y

   If Yes

2) Have you had more than 1 stroke?
   1 Y
   2 N

3) Did you seek medical care?
   1 Y
   2 N

4) If Yes, Where?
   1 Doctor
   2 Village clinic
   3 Hospital

5) When was your first
   stroke? Date: …. mm/year…..

6) Which side of the body was most affected? a) Rt b) Lt c) both
<table>
<thead>
<tr>
<th>Question</th>
<th>No</th>
<th>Yes</th>
<th>No improvement(1)</th>
<th>Slight Improvement(2)</th>
<th>Modest Improvement(3)</th>
<th>Nearly complete resolution</th>
<th>Complete resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did you have weakness or paralysis in one or both limbs</td>
<td>€</td>
<td>€</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did you have numbness or tingling sensation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did you have slurred speech</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Did you have changes in your vision</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Did you have difficulty with your balance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Did you have trouble with thinking</td>
<td></td>
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</tr>
</tbody>
</table>

7) Where are you getting medical care?

1 Doctor
2 Village clinic
3 Hospital
4 Other specify_____________

8) How often do you visit your medical provider

1 once weekly
2 once every two weeks
3 6months
9) Do you have any of these diseases/ problems?

1 Diabetes
2 chronic Kidney disease
3 Heart Disease

H. Hypertension

1) Have ever been told by a doctor that you have high blood pressure?

1 Yes
2 No

2) If yes, how long have you known that you have high blood pressure? …………

3) Are you using any blood pressure drugs?

1 Yes.
2 No ……………………………

4) If yes, how long have you been on medication? ……………………………

I’d now like to ask you about your prescription medications. A prescription medicine is one that you can ONLY get if you have a prescription from your doctor. You may find it helpful to have your medication bottles in front of you for this part of the interview.

What prescription medications are you currently taking? For each of the medications that you are taking, I’d like for you describe how often in the past week you had difficulty taking this medication as prescribed. (1=Never, miss 0 doses/ week; 2=rarely, miss 1 dose/ week; 3=Sometimes, Miss 2 – 3 doses/ week; 4=Often, miss >3 doses/ week)
### Which blood pressure drugs are you using?

<table>
<thead>
<tr>
<th>Medication name</th>
<th>Dose</th>
<th>Adherence rates</th>
<th>If one or more missed state the primary reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>_______ mg, _____ times per day</td>
<td>1Never missed</td>
<td>1Forgot</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2Rarely missed</td>
<td>2Financial</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3Sometimes</td>
<td>reasons</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4Often</td>
<td>3Dose</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1Forgot</td>
<td>4Other</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2Financial</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3Dose</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>_______ mg, _____ times per day</td>
<td>1Never missed</td>
<td>1Forgot</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2Rarely missed</td>
<td>2Financial</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3Sometimes</td>
<td>reasons</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4often</td>
<td>3Dose</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1Forgot</td>
<td>4Other</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2Financial</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3Dose</td>
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<td></td>
<td>4Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>_______ mg, _____ times per day</td>
<td>1Never missed</td>
<td>1Forgot</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2Rarely missed</td>
<td>2Financial</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3Sometimes</td>
<td>reasons</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4often</td>
<td>3Dose</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1Forgot</td>
<td>4Other</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2Financial</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3Dose</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>_______ mg, _____ times per day</td>
<td>1Never missed</td>
<td>1Forgot</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2Rarely missed</td>
<td>2Financial</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3Sometimes</td>
<td>reasons</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4often</td>
<td>3Dose</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1Forgot</td>
<td>4Other</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2Financial</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3Dose</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4Other</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5) Do you take aspirin on a regular basis? **Yes** **No (Go to # 3)**

6) What daily dose of aspirin do you take?
   1. 1.81 mg (i.e. baby aspirin)
   2. 162 mg (e.g., Half aspirin)
   3. 325 mg (i.e., adult aspirin)
   4. 650 mg or more

7) What other medications are you using?
   1. Warfarin
   2. Atorvastatin.
   3. Nootropil
   4. Vitamin B supplements

**Hypertension knowledge:**

1) *Am going to make a few statements about hypertension/ high BP, tell me if they are true or false*

<table>
<thead>
<tr>
<th>Statement</th>
<th>Yes(1)</th>
<th>No(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased blood pressure causes stroke</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increased blood pressure causes heart diseases</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you measure your blood pressure</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2) Symptoms of high blood pressure include:

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Yes (1)</th>
<th>No (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>headache</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blurred vision</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chest pain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Confusion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No symptoms</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3) Drugs control BP: a)T  b)F

4) Controlling BP:

<table>
<thead>
<tr>
<th>Effect</th>
<th>No (1)</th>
<th>Yes(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduces stroke</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increases stroke</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I don’t know</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5) Good BP control requires:

<table>
<thead>
<tr>
<th>Control Method</th>
<th>No (1)</th>
<th>Yes (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exercise</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medication</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6) Symptoms occur:

1. When blood pressure is low
2. When blood pressure is high

7) How often do you measure your blood pressure?

1. Daily
2. Once a month
3. Once every 2 months
4. Never

Patient provider communication:

<table>
<thead>
<tr>
<th>Do you currently understand</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>How to take your medication</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Why you are taking your medication</td>
<td></td>
<td></td>
</tr>
<tr>
<td>What side effects might experience from your medication</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Who to inform or what to do when run out of drugs</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Where do you seek your information about your health?

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>How</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you have a method or person that helps you keep track of your medication each day</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Who or what helps you?(check all that apply)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>€ Family member</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>€ Friend</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>€ Paid care provider( home health aide, nurse)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>€ Pill box</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other specify</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

J. Smoking

Have you ever smoked cigarettes? 1) Yes  2) no

If yes for how long

How many sticks per day? .................
K. Alcohol

I) Do you take alcohol?  
1) Yes.  
2) No.

If yes

ii) Which alcoholic drink do you take?
   
a). Spirits.  
b) Beers.  
c) Wine.  
d) Any type.

iii) How many units of beer do you take per month?
   
a). ≤ 8 units.  
b) 8-28 units.  
c) > 28 units.

   How many units of waragi / spirits do you take per month?

   a) 2 units.  
b) 4 units.  
c) More than 8 units.