Stroke-related knowledge and attitudes among university students in Northeast Nigeria

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Abstract

Stroke education programs at schools and colleges help to promote public knowledge of stroke, but the impact in Nigeria is not well known. This study assessed stroke-related knowledge and attitudes among university students in Nigeria, where health studies are parts of college curricula. This was a cross-sectional study of students at three universities in Northeast Nigeria. Using questionnaire survey, we assessed biographical data and participant knowledge of the primary site, warning signs and risk factors of stroke. Responses were graded on a knowledge score, where ≥2.5 points indicated adequate knowledge. Data were analyzed with the SPSS version 21 program. We studied 824 participants, 67.1% males. Males were older than females (mean age ± SD: 27.42±5.58 years versus 26.27±5.31 years; P = 0.009; 95% CI: 0.29 – 1.99) and 14.5% participants had stroke lectures during general studies. Major sources of stroke knowledge were personal discussions (44.6%) and internet websites (24.5%). Only 15.7% participants correctly identified the brain as the primary site of stroke, while knowledge of one or more stroke warning signs and risk factors were noted in 42.2% and 49.6%, respectively. Mean knowledge score was 1.08 ± 0.99. Adequate knowledge of stroke was noted in 13.2% participants, and was higher in females (17.7% versus 10.7%; P = 0.01). Logistic regression analysis showed significant associations between adequate knowledge of stroke with female sex (OR 1.8; 95% CI: 1.2 – 2.8; P = 0.008) and a history of stroke in close relatives (OR 1.7; 95% CI: 1.1 – 2.6; P = 0.025) but not with age, academic discipline or stroke lectures. University students in Northeast Nigeria have low knowledge of stroke, which is worse in males. Although health issues are taught at universities, little is taught on stroke, suggesting a need to prioritize stroke knowledge in the university curriculum.

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Introduction

Stroke is the third leading cause of death worldwide and a major cause of adult disability.[1] Each year, about 5.5 million people die of stroke globally and half of the 10 million survivors suffer chronic disabilities lasting five years or more.[2,3] Although stroke incidence has decreased in most high-income countries, the global lifetime risk of stroke has increased from 22.8% in 1990 to 24.9% in 2016 due to rising incidence in the low and middle-income countries of East Asia, Eastern Europe and Sub-Saharan Africa.[4]

Emergency medical care helps to improve health outcomes after stroke; however, most patients arrive late at the hospital due to poor knowledge of stroke and its various warning signs.[5,6] The public also lacks adequate knowledge of stroke risk factors such as hypertension, diabetes mellitus, obesity, high cholesterol, physical inactivity and cigarette smoking that are potentially reversible with medical treatment and changes in lifestyle.[7-9]

In a study from Thailand, a third of stroke survivors didn't know a single stroke risk factor, while a Nigerian study found two-

thirds of patients with raised cholesterol only knew of their high risks after they experienced stroke.[7,9] In another study from Nigeria and Ghana, hypertension was the only risk factor identified by a majority of stroke survivors, their family members and healthcare staff, most of whom lacked knowledge of stroke risks due to diabetes, obesity, high cholesterol and cigarette smoking.[10] Other studies similarly reported poor knowledge of stroke among Nigerians, although a few studies found good knowledge.[11-14] Poor public knowledge of stroke was also observed in Uganda, Morocco, Poland and the United States, suggesting a global trend.[15-18]

Stroke care protocols seek to bridge the knowledge gap through public education programs focused on stroke awareness and prevention via hospital counselling of high-risk patients, community advocacy for stroke care, public awareness campaigns on mass media, and health education studies at schools and colleges.[19] Although stroke mostly affects elderly people, young family members such as school and college students are often the first witnesses at the scene. Research has also shown that young people can be taught to improve their knowledge of stroke warning signs and pass it onto family members at home.[20] Youths themselves are at risks of stroke from genetic disorders and illicit drug use. Thus, schools and colleges provide ideal settings for stroke education programs.

In Nigeria, the National Universities Commission has mandated all universities to teach compulsory General Studies (GS) on health issues in the first and second years of undergraduate education, with emphasis on hypertension, diet, exercise, obesity, drug abuse and alcohol dependence, all of which influence stroke risks.[21] Yet, it remains unclear whether health studies at Nigerian universities have imparted knowledge of stroke on students. A previous study in Southwest Nigeria reported good knowledge of stroke among students and staff of the Obafemi Awolowo University, Ile-Ife, but no assessments were made on health studies or their effects on students' knowledge.[22]

To our knowledge, no study has assessed the effects of stroke education on stroke-related knowledge and attitudes among Nigerian university students. Therefore, we aimed to assess stroke-related knowledge and attitudes amongst third to fifth year undergraduate students enrolled at three universities in Northeast Nigeria.

Material and Methods

Study design and sampling

This was a cross-sectional study conducted during February to April 2021. Using purposive sampling method, we studied third, fourth and fifth-year undergraduate students of Abubakar Tafawa Balewa University (ATBU) Bauchi; Federal University Kashere (FUK), Gombe State; and Federal College of Education Yola (FCEY), Adamawa State, which is affiliated to the University of Maiduguri, Borno State, and awards its Bachelor of Education degrees.

Participants were recruited from the Faculties of Science, Agriculture, Education and Arts/Social Sciences. Medical students were excluded from the study due to potential exposure to stroke knowledge outside the GS curriculum. Surveys were conducted within lecture halls at the end of regular lectures after prior permission was obtained from school authorities and lecturers. Investigators who supervised the study were all trained by a neurologist on how to conduct surveys, explain them clearly to participants and clarify any queries. Participation was voluntary and participants remained anonymous on the survey questionnaire.

Instrument and Data Collection

The study utilized a structured questionnaire interview earlier tested in a pilot survey at a different university in Yola, Adamawa State. Questionnaires were self-administered by participants in each class over a period of six to ten minutes, however, those who needed more time were allowed to stay until completion.

Data obtained from participants included demographic information (age, gender, state of origin, degree program, academic year), prior GS lectures on stroke, personal history of stroke, stroke in close relatives, planned response to stroke in a family member (take victim to the mosque, church, traditional-healer, pharmacy, hospital, or wait for recovery), prior work in healthcare services and sources of stroke knowledge (personal discussions, newspapers, radio, television, internet/social media, school lectures). States of origin were grouped into the six geopolitical zones of Nigeria, while degree programs were grouped in two academic disciplines of either pure and applied sciences (e.g., Bachelor of Science in Agriculture; Bachelor of Physics Education) or humanities and social sciences (eg, Bachelor of Arts in History; Bachelor of Political Science).

Participant knowledge of stroke was based on knowledge of: i) the primary site of stroke; ii). one or more stroke warning sign; iii) one or more stroke risk factor. The primary site of stroke was the brain, and any other response (including a missed response) was deemed incorrect. Stroke warning signs were adopted from Schneider *et al*., and included: sudden trouble speaking or understanding others; sudden numbness or weakness of the face, arm or leg; sudden poor vision in one or both eyes; sudden dizziness, difficulty walking or loss of balance; and sudden headache with no known cause.[23] Stroke risk factors were based on the INTERSTROKE Study which identified the following 11 risk factors in 22 countries including Nigeria: hypertension, diabetes mellitus, obesity, high cholesterol, cigarette smoking, heart disease, excess use of alcohol, lack of exercise, drug use/abuse, old age and a family history of stroke.[24] Responses lacking the term "sudden" were deemed valid if otherwise correct.

Correct responses to primary site and warning signs of stroke were each awarded one point maximum, while each correct stroke risk factor was awarded 0.5 point. The total points obtained by participants formed a "stroke knowledge score" where ≥2.5 points (out of 7.5 points maximally obtainable) indicated adequate knowledge of stroke, whereas <2.5 points indicated low knowledge. For example, naming the primary site (1 point), a warning sign (1 point) and a risk factor (0.5 point) all correctly yielded 2.5 scores, which indicates adequate knowledge of stroke.

Statistical analysis

Data were analyzed with the Statistical Package for the Social Sciences (SPSS) program version 21 software (IBM Corporation, New York, USA). Categorical variables such as sex and academic discipline were analyzed with the Chi-Square and Fisher's Exact tests, whilst means of continuous variables such as age and stroke knowledge score were analyzed with the Student's *t* test. Binary logistic regression was used to analyze associations between adequate knowledge of stroke and a number of candidate variables. Results were presented as proportions, means (± standard deviations, SD) and odds ratios (OR) with 95% confidence intervals (CIs). Except for the three tests on stroke knowledge, all other missing answers were excluded from analysis, thus, percentages

reflected answers only. P values less than 0.05 were considered significant.

Ethical considerations

Ethical clearance for the study was obtained from the Ethics and Research Committee of Abubakar Tafawa Balewa University Teaching Hospital Bauchi (Ref. No. 006/2021). All study subjects signed a written, informed consent, and the study protocol has conformed with the Helsinki Declaration.

Results

The study enrolled 824 participants out of 900 students targeted, thus response rate was 91.6%. Mean age (± SD) was 26.99 ± 5.49 years, with males constituting 67.1% (M/F = 2:1) and significantly older than females (27.42 ± 5.58 years versus 26.27 ± 5.31 years; P = 0.009; 95% CI, 0.29-1.99). Other characteristics of participants are shown on Figure 1 and Table 1.

The brain was the primary site of stroke according to 15.7% participants, while others named the arm, leg or both (20.0%), heart (10.1%), muscles and joints (1.6%), spinal cord (1.2%) and other body organs (8.6%). Should stroke affect a family member, participants would take them to hospital (94.4%), prayer house (2.5%), traditional healer (1.0%), the neighborhood pharmacy (1.0%) or wait for symptoms to resolve (1.2%). Major sources of stroke knowledge included personal discussions (44.6%), internet/social media websites (24.5%), GS lectures (13.1%), newspapers (4.2%), radio (11.0%) and television (11.2%).

Knowledge of stroke warning signs and risk factors were observed in 42.2% and 49.6% participants respectively, while 13.2% had adequate knowledge of stroke (Table 2). The mean stroke knowledge score (±SD) was 1.08 ± 0.99, with significantly better scores in females compared to males (Mean ± SD: 1.25 ± 1.0 vs. 1.0 ± 0.97; P = 0.001, 95% CI: 0.10 – 0.39).

We performed logistic regression analysis where adequate knowledge of stroke was the dependent variable while the covariates were age, gender, academic discipline, history of stroke in close relatives and exposure to GS lectures on stroke. Adequate knowledge of stroke was significantly associated with female gender (OR 1.8; 95% CI: 1.2 – 2.8; P = 0.008) and stroke in close relatives (OR 1.7; 95% CI: 1.1 – 2.6; P = 0.025) but not with age (OR 1.0; 95% CI: 0.9 – 1.0; P = 0.51), pure/applied science discipline (OR 0.8; 95% CI: 0.5 – 1.3; P = 0.37) or GS lectures on stroke (OR 1.0; 95% CI: 0.5 – 1.9; P = 0.99).

Discussion

Our results show low knowledge of stroke among university students who have studied health issues in the GS curriculum. This finding contradicts a previous report of good knowledge of stroke among university students in Southwest Nigeria.[22] Differences in study design may explain the different results. While we assessed stroke knowledge with open-ended questions, the Southwest study used close-ended questions with multiple choice answers. We also assessed knowledge of the primary site of stroke, which wasn't assessed by Obembe *et al.*[22]

In our study, stroke risk factors had the highest knowledge, followed by stroke warning signs. This is similar to findings in the Southwest study, where knowledge was higher for risk factors than for warning signs.[22] The primary site of stroke recorded the least knowledge in our study, with only 15.7% participants correctly naming the brain, while a large majority believed that stroke occurred in the heart, upper and lower limbs, spinal cord, muscle and joints, the neck, liver, bones, etc. However, correct knowledge of the primary site didn't necessarily confer adequate knowledge of stroke, which was observed in only 13.2% participants.

Hypertension was, by far, the commonest stroke risk factor mentioned by participants, followed by diabetes and heart disease, whereas drug abuse, obesity and old age were the least mentioned. Stroke warning signs most commonly mentioned were headache, weakness/numbness of the face, arm or leg, and difficulties in speech.

The low knowledge of stroke observed in this study is consistent with results from a previous study on school students which also utilized a score assessing knowledge of the primary site, warn-

Table 1. Biographical characteristics of participants (%).

Age in years (mean ± SD)	**26.99 ± 5.49**
Geopolitical zone of origin	
Northeast	633/785 (80.6)
Northwest	24/785 (3.1)
Northcentral	74/785 (9.4)
Southeast	21/785 (2.7)
Southwest	19/785 (2.4)
South-South	13/785 (1.7)
Federal Capital Territory	1/785 (0.1)
Academic discipline	
Pure/Applied sciences	465/809 (57.5)
Humanities/Social sciences	344/809 (42.5)
Academic year	
3rd year	177/811 (21.8)
4th year	524/811 (64.6)
5th year	110/811 (13.6)
Type of accommodation	
School hostel	256/784 (32.7)
Private hostel	374/784 (47.7)
Family home	134/784 (17.1)
Other	3/784 (0.4)
Personal history of stroke	29/798 (3.6)
Stroke in close relatives	344/799 (43.1)

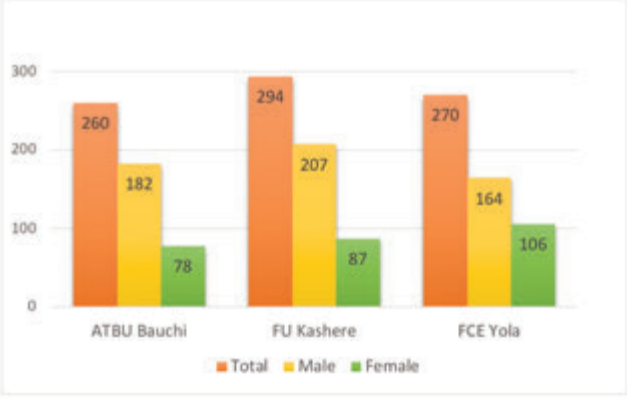

Figure 1. Participants per study site by total and gender counts.ATBU = Abubakar Tafawa Balewa University; FU = Federal University; FCE = Federal College of Education.

ing signs and risk factors of stroke.[25] Other studies have similarly reported low knowledge of stroke in Sub-Saharan Africa.[13,15] In a study on hypertensive and diabetic patients attending a hospital in Northcentral Nigeria, Wahab *et al.* found only 39.8% respondents could name one stroke risk factor.[13] In another study from Kampala in Uganda, only 45.2% of the general public could name hypertension as a stroke risk factor, while fewer than 5% knew of stroke risks due to obesity, high serum cholesterol, cigarette smoking and alcohol abuse.[15]

Our report of better knowledge in females also agrees with observations made in earlier studies, although other studies have shown better knowledge in males.[23,26,27] The reasons for the gender disparity across studies are not entirely clear, but they may reflect different health information-seeking behavior among males and females in different societies. For instance, compared to males, female students attending a college in New Jersey, United States, were more likely to seek health information from the internet and social media, to consult a medical professional, and to confirm that information with a medical professional.[28]

We also found a significant association between participant knowledge of stroke and a history of stroke in a close relative, but there were no associations with other participant variables, such as age, academic discipline or exposure to school lectures on stroke. This supports the results of some studies but contradicts those of other studies.[13,16,25] The lack of association between stroke lectures and stroke knowledge was most surprising, but it could be the result of a poor stroke curriculum or inadequate lectures at the study sites. Another possible explanation is poor recall by participants who never had stroke lectures, considering that a large majority of their classmates have denied having stroke lectures.

Notwithstanding the low knowledge of stroke, almost all participants in our study would take a victim to hospital rather than the pharmacy, mosque, church or traditional healer, suggesting a strong belief that stroke is a medical emergency and not a "spiritual attack" as widely believed in a study from West Africa.[10] A Ugandan study also found only 2.3% participants believed stroke was a result of witchcraft or the will of God.[15] We find the attitudes of our participants encouraging, as rapid transit of stroke victims to hospital allows for timely access to thrombolytic therapy (where that is available), use of supplemental oxygen, control of hypertension and blood glucose, neurosurgical intervention, early antiplatelet therapy and other measures known to improve health outcomes for stroke patients.[19]

We have observed a high prevalence of stroke amongst close relatives of participants, particularly grandparents, parents, uncles and aunts. This is expected in elderly persons, as three-quarters of all strokes occur in those aged 65 years or more.[29] However, the 3.6% stroke prevalence among participants is probably high for a young age group, although a recent study suggests even higher risks in East Asia and Africa.[4] It is not clear if participant self-report of stroke was based solely on a doctor's diagnosis or included self-diagnosis that could be erroneous due to the low knowledge of stroke in this study. Another possible explanation is a high prevalence of genetic disorders associated with stroke in the young, such as sickle cell disease, Fabry disease and thrombophilic states such as Protein C, Protein S and anti-thrombin-III deficiencies.[30]

Most participants obtained knowledge on stroke from personal discussions or internet/social media sites, whereas traditional media such as radio, television and newspapers contributed little. This is consistent with recent findings reporting the importance of the internet in health information dissemination among college students.[28] This finding has major implications for stroke education programs and other public health campaigns targeting college students and youths in general.

The main strength of our study was the use of a cumulative score to assess three areas of stroke knowledge, which was then correlated with curricular studies and other participant characteristics that could impact on knowledge of stroke. Previous studies from Nigeria have been more limited, as none has assessed the effects of stroke studies on student knowledge and attitudes.

We also assessed stroke knowledge based on participant self-

Table 2. Participant knowledge of stroke primary site, warning signs and risk factors analyzed by Chi-Square tests.

Knowledge of stroke	All (%) N = 824	Males (%) n = 553	Females n = 271	P value
The primary site of stroke is the brain	15.7	13.7	19.6	0.07
Warning signs of stroke				
Numbness/weakness of face, arm or leg	26.1	25.1	28.0	0.50
Difficulties in speaking/understanding	20.3	19.0	22.9	0.30
Dizziness/loss of balance	12.7	13.4	11.4	0.49
Headache of unknown cause	34.8	31.6	41.3	0.06
Poor vision in one or both eyes	6.4	6.5	6.3	0.90
Risk factors for stroke				
Hypertension	42.2	40.7	45.4	0.42
Diabetes	15.0	15.4	14.4	0.75
Physical inactivity	3.9	3.4	4.8	0.36
Heart disease	9.2	8.9	10.0	0.64
Obesity	2.3	2.0	3.0	0.40
Raised blood cholesterol	4.1	4.2	4.1	0.95
Drug use and abuse	1.3	0.9	2.2	0.13
Cigarette smoking	2.9	2.2	4.4	0.08
Excess use of alcohol	3.0	2.0	5.2	0.02*
Family history of stroke	2.1	2.2	1.8	0.76
Old age	1.3	1.4	1.1	0.69
Knowledge of 1 – 2 risk factors	40.9	36.5	49.8	0.02*
Knowledge of ≥ 3 risk factors	8.7	9.2	7.7	0.52
Adequate knowledge of stroke	13.2	10.7	17.7	0.01*

Asterisks (*) indicate statistically significant P values.

recall rather than multiple short answers (MSAs) that could introduce selection bias. In our view, MSA-based knowledge assessments are less relaible since they provide clues to the right answer for low-knowledge respondents. Poor-knowledge respondents may also attain high scores by selecting multiple answers to each question when there are no penalties for guessing (such as negative marks for wrong answers). Thus, we avoided selection bias by relying solely on participant self-recall in assessing stroke knowledge. Moreover, a bye-stander witnessing a stroke event would recognize it only from memory, not from a list of true and false warning signs.

A major limitation of our study was the use of self-administered questionnaires, which has allowed some participants to withhold vital data. As a result, we had to exclude a few participants from data analysis. This could be avoided with investigator-administered surveys, but that would incur extra costs in time and personnel that were beyond our financial resources. Participants' pre-college background (such as geopolitical zone of origin) could also influence knowledge of stroke, however, large disparities in sample size of geopolitical zones impeded analysis of this potential variable. Our use of non-random purposive sampling may also have limited our results. We tried to mitigate these limitations by studying three sites and providing detailed instructions before conducting each survey. To make our sample more representative of the university population, we recruited participants from four faculties across the two broad disciplines of pure/applied sciences and humanities/social sciences at each study site.

In conclusion, this study shows low levels of stroke-related knowledge among university students in Northeast Nigeria. Most students received no teaching on stroke during compulsory general studies on health, which made them seek stroke-related knowledge from personal discussions and internet/social media sites. While a large majority of students would take stroke victims to hospital, the limited knowledge of stroke warning signs and risk factors could delay the urgent medical care known to improve health outcomes for stroke patients. These findings suggest a strong need for Nigerian universities to review and improve curricular studies on stroke.

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