

STROKE KNOWLEDGE IN AFRICAN AMERICANS: A NARRATIVE REVIEW

Anjail Z. Sharrief, MD, MPH¹; Brenda Johnson, DNP²;
Sharon Abada, BS³; Victor C. Urrutia, MD⁴

Objective: The purpose of this review is to evaluate the state of knowledge in regard to stroke literacy in African Americans. This topic is important for assessing the specific gaps in stroke knowledge for this population, as well as to evaluate the methodology that has been used to assess stroke literacy.

Methods: This narrative review includes studies that evaluated and reported stroke knowledge in African Americans and were published between January 2000 and October 2015.

Results: Our review revealed that disparities may exist in recognition of headache and visual symptoms, knowledge of the organ in which stroke occurs, and identification of tobacco use as a risk factor. Stress may be perceived as a more important risk factor among African Americans than among White Americans. The literature does not suggest disparities in knowledge of the appropriate action to take for stroke.

Conclusions: Racial disparities may exist for specific domains of stroke knowledge. Future studies should explore specific gaps in knowledge to be addressed in stroke prevention interventions for African Americans. Standardization of methods is needed to aid comparisons across populations. The relationship between stroke knowledge and clinical outcomes also needs to be evaluated. *Ethn Dis*. 26(2):255-262; doi:10.18865/ed.26.2.255

Keywords: Stroke; Risk Factors; African Americans; Health Care Disparities; Minority Health

INTRODUCTION

Stroke remains a leading cause of death in the United States.¹ While stroke mortality has decreased over time, it remains two times higher for African Americans compared with White Americans.¹ Stroke mortality and incidence have decreased at slower rates for African Americans and therefore stroke disparities have increased over time.²

Racial differences in stroke incidence and mortality are partially explained by disparities in prevalence, control, and the impact of risk factors, especially hypertension and diabetes.^{3,4} Some approaches to addressing stroke disparities in African Americans have focused on improving risk factor awareness and control and increasing stroke literacy, which has been previously defined as the knowledge of stroke

symptoms and risk factors.⁵⁻⁷ Additional aspects of stroke literacy may include knowledge of treatment and appropriate stroke-related behavior.

Several studies have shown that while the majority of Americans do not have a basic understanding of stroke, stroke knowledge is poorer among African Americans.^{1,8} This finding is not consistent, and many studies do not show racial differences in all aspects of stroke knowledge. There are limitations in several of these studies including the types of questions posed and biases inherent to telephone surveys.⁹⁻¹¹

In this article, we review several studies that have assessed stroke knowledge in primarily African American groups or that have explored disparities in stroke knowledge. We also summarize specific gaps in knowledge that can be targeted for stroke literacy interventions.

¹Department of Neurology; University of Texas Health Science Center at Houston, Medical School

²Department of Neurology, Johns Hopkins Hospital

³Department of Health Promotion and Behavioral Sciences, University of Texas Health Science Center at Houston School of Public Health

⁴Department of Neurology, Johns Hopkins University School of Medicine

Address correspondence to: Anjail Z. Sharrief, MD; University of Texas Health Science Center at Houston, Medical School; Department of Neurology; 6431 Fannin Street, MSB 7.110; Houston, TX 77030; 713.500.6538; Anjail.Z.Sharrief@uth.tmc.edu

METHODS

Computerized searches of the literature for relevant articles written in English and published between January 1, 2000 and October 31, 2015 were conducted in April 2013 and December 2015 using Medline. Search terms included stroke knowledge, stroke literacy, African American, Black, disparities, and attitudes. Hand searches were performed of references in articles identified through the com-

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puter searches. Studies were included if they met the following criteria: 1) were conducted in the United States in majority African American communities or where knowledge specific to African Americans was reported; 2) were conducted in the general community (not hospitalized or institutionalized patients); and 3) reported knowledge of signs and symptoms of stroke, the organ in which stroke occurs, risk factors for stroke, treatment of stroke, or

appropriate action to take for stroke. Among 273 abstracts identified and 35 articles reviewed, 14 articles were selected for the narrative review based on these criteria. These 14 articles are summarized in Table 1.

DISCUSSION

Location of Stroke

Knowledge of the organ in which stroke occurs was assessed in a few studies that reported stroke knowledge in African Americans. Willey et al reported on a stroke literacy survey in Central Harlem in which 56.3% of African Americans compared with 72.7% of Whites correctly identified the brain in a multiple choice question.⁷ Biederman et al reported on a telephone survey of two counties in North Carolina in which 59.6% of African Americans compared with 77.7% Whites answered correctly to an open-ended question that stroke occurs in the brain or head.¹² Similarly, 50.7% of participants in a telephone-based survey of African Americans in Detroit responded that a stroke occurs in the brain.¹³ In our study of stroke knowledge in inner-city Baltimore, 57.5% of participants, 95% of whom were African American, correctly identified the brain in a multiple-choice question.¹⁴ Although this topic has not been addressed by many studies, the literature suggests that there is a gap in this basic knowledge. This knowledge may be important for increasing self-efficacy in stroke risk factor and symptom recognition, which may positively influence health behavior.¹⁵⁻¹⁷

Signs and Symptoms

Knowledge of signs and symptoms of stroke is important for taking appropriate action when a stroke occurs. While the majority of prior studies that have reported on stroke knowledge in African Americans have assessed knowledge of signs and symptoms, there is some discrepancy in the literature about the degree to which disparities exist. Much of the literature is based on reports of data from the Behavioral Risk Factor Surveillance System (BRFSS), a CDC-based telephone survey, which contains a heart and stroke module.¹⁸ This module includes six close-ended (yes/no) questions about signs of stroke and one question about the correct action to take for heart attack or stroke symptoms. The symptoms of stroke included in this module are: confusion or trouble speaking; sudden loss of vision, sudden numbness or weakness; sudden trouble walking, dizziness, or loss of balance; and sudden headache. Chest pain is also included as an incorrect answer.

Greenlund et al used 2001 BRFSS data to evaluate disparities in stroke symptom knowledge.¹⁹ African American race was associated with poorer symptom knowledge based on likelihood of answering all questions correctly after controlling for age, risk factors, and measures of socioeconomic status (SES). While there were no statistical analyses for differences in recognition of individual symptoms between African Americans (AA) and Whites (W), visual symptoms (57.3% AA vs 70.4% W) and trouble speaking or confusion (80.8% AA vs 90.2% W) showed the greatest

Table 1. Knowledge among African American participants in stroke literacy studies

Study/Methods	Risk Factors	Signs/Symptoms	Action
Biederman ¹² 2012; N = 2063; Telephone, open-ended; 26.9% AA, 68.7% F; Mean age (all participants) = 51.6 ± 17.7	Top 3 reported: HTN (39.8%); DM (9.7%); diet (8.2%)	Top 3 reported: numb/weak (24.1%); dizzy (17.4%); chest pain (11.8%)	90.1% call 911
Fang ²⁰ 2005; N = 71994; Telephone (BRFSS), close-ended ^a ; 10.6% AA, 62.2% F; Age ≥ 18		confused/ impaired speech (79.0%), numb/weak (88.0%), visual (58.8%), dizzy/difficulty walking (75.8%), headache (55.8%)	83.7% call 911 "for heart attack or stroke"
Fussman ²¹ 2009; N = 4790; Telephone (MiBRFS), open-ended; Specific demographic data not reported; Age ≥ 18	Top 3 reported: HTN (33.7%); stress (33.6%); diet (33.1%)	Top 3 reported: numb/weak (63.1%), confused/impaired speech (32.5%), visual symptoms (16.7%)	
Greenlund ¹⁹ 2003; N = 61019; Telephone (BRFSS), close-ended; 10% AA, 40.8% F; Age ≥ 18		confused/impaired speech (80.8%), numb/weak (91.2%), visual (57.3%), dizzy/difficulty walking (79.0%), headache (58.4%)	84.3% call 911 for "heart attack or stroke"
Lutfiyya ²³ 2008; N = 11269; Telephone (BRFSS), close-ended; 100% AA, 100% F; Age ≥ 18		confused/impaired speech (94.2%), numb/weak (96.5%), visual (81.7%), dizzy/difficulty walking (91.6%), headache (58.3%)	86.6% call 911 for "heart attack or stroke"
Lutfiyya ²⁴ 2008; N = 19163; Telephone (BRFSS), close-ended; 9.4% AA, 100% male; Age 18-90		confused/impaired speech (89.4%), numb/weak (95.2%), visual (77.7%), dizzy/difficulty walking (89.7%), headache (56.2%)	82.1% call 911 for "heart attack or stroke"
Lutfiyya ²² 2009; N = 16104; Telephone (BRFSS), close-ended; 13.7% AA, 100% F; Age 45-54; Mean age (AA) = 49.23		confused/impaired speech (95.7%), numb/weak (97.7%), visual (84%), dizzy/difficulty walking (92.5%), headache (65.7%)	87.9% call 911 for "heart attack or stroke"
Mochari-Greenberger ²⁶ 2014; N = 1205; Telephone (AHA NWTS), open-ended; 17% AA, 100% F; Age ≥ 25		Top 3 reported: numb/weak (55%), confused/impaired speech (44%), headache (24%)	86% call 911
Pratt ¹³ 2003; N = 379; Telephone, open and close-ended; 100% AA, 71.6% F; Age ≥ 50; Mean age = 64.7 ± 10.0	"Causes": HTN (58.8%), stress (29.3%), diet (16.9%)	Top 3 reported: numbness (29.3%), dizziness (16.9%), slurred speech (15.5%)	70.4% call 911
Saller ²⁵ 2010; N = 188; Person-to-person, close-ended; 100% AA, 67% F; Age 18-74; Mean age = 34.9 ± 13.5	HTN (90.4%), stress (82.4%), tobacco (61.7%), DM (46.8%)	confused/impaired speech (60.1%), numb/weak (72.3%), vision (35.6%), dizzy/difficulty walking (43.1%), headache (39.9%)	43.1% call 911
Sharrief ¹⁴ 2015; N = 80; Paper questionnaire, close-ended; 95% AA, 30% F; Age 22-82; Mean age = 51.5, SD = 11.2	stress (90%), HTN, DM, and tobacco (80%), sleep apnea, AF, obesity (58.6%)	77.5% correctly identified weakness, slurred speech, and vision loss as symptoms of stroke	87.5% call 911
Skolarus ¹⁷ 2010; N = 332; Person-to-person survey, vignettes; 89.5% AA, 71% F; Median age (adults) = 47 (IQR 33-54)		51% of adults correctly identified stroke vignettes	89% adults would call 911 for "stroke"
Wiley ⁷ 2009; N = 1023; Person-to-person, close-ended; 65.7% AA, 68% F; Age 13-94; Mean age = 51.6	HTN (87.3%), DM (53.8%), smoking (42.3%)	speech (62.5%), weakness (70.8%), blurred vision (44.0%), headache (59.6%)	89.6% call 911

a. Close-ended questions include yes/no and multiple choice.

AA, African American; F, female; RF, Risk factors; HTN, hypertension; DM, diabetes mellitus; AF, atrial fibrillation; BRFSS, Behavioral Risk Factor Surveillance System; MiBRFS, Michigan Behavioral Risk Factor Survey; AHA NWTS, American Heart Association National Women's Tracking Survey.

unadjusted differences by race. Headache was least likely to be recognized by both groups (58.4% AA vs 62.4% W). Fang et al also showed the greatest discrepancy in recognition of loss of vision and speech/confusion by race, along with overall poor recognition of headache as a symptom.²⁰ Similarly, Fussman et al reported that African Americans were less likely to identify trouble with vision, or trouble speaking or understanding speech compared with Whites.²¹

Lutfiyya et al used BRFSS data (2003-2005) to examine disparities in stroke symptom knowledge for midlife women aged 45-54 years by calculating a composite knowledge score.²² A low score indicated that fewer than four of the seven questions were answered correctly. While a low score was associated with African American race after adjusting for age and SES measures, only 5% of all women surveyed received a low score. Symptoms least likely to be identified as symptoms of stroke included severe headache (65.7% AA vs 72.4% W) and trouble seeing in one or both eyes (84% AA, 93.4% W). More than 90% of African American and White participants identified confusion or trouble speaking, sudden numbness or weakness, or sudden trouble walking/dizziness/loss of balance as symptoms of stroke. Similar methodology was used to assess disparities among African American women aged 18 to 64 years using 2003-2005 BRFSS data; however, a composite heart attack and stroke knowledge score was the primary endpoint.²³ Again, visual symptoms (81.7%) and headache (58.3%) were

least likely to be correctly identified in the module. Similar findings were reported when these methods were used to examine disparities in men using the BRFSS module.²⁴

Other investigators have used slightly different methods to explore disparities in symptoms knowledge. Sallar et al conducted a cross-sectional study using a survey administered by person-to-person interview in four counties in the Mississippi Delta.²⁵ This survey was conducted in a group of 188 African Americans, with mean age 34.9. Compared with numbness/weakness (72.3%) and confusion (62.1%), recognition of visual symptoms (35.6%), dizziness (43.1%), and headache (39.9%) was poor. Though the stroke literacy study by Willey et al found no significant difference in symptoms recognition between African Americans and Whites, recognition of blurred vision and headache was poor for both groups.⁷ However, in our Baltimore-based study, 77.5% of participants identified "all of the above" (weakness, slurred speech, and vision loss) as the correct answer to a multiple choice question regarding stroke symptoms.¹⁴ Visual symptoms, therefore, may be accepted as stroke symptoms in combination with the more well-acknowledged symptoms of weakness and slurred speech, but may not be recognized as stroke symptoms on their own.

In the Detroit-based study using open-ended questions, participants mentioned numbness (29.3%), slurred speech (19.5%), dizziness (16.9%) and severe headache (15.6%) when asked about warning

signs of stroke.¹³ The study by Biederman et al also used open-ended questions and found that among African American participants, numbness (24.1%), dizziness (17.8%), and chest pain (11.8%) were most likely to be mentioned as first signs of stroke.¹² White participants similarly mentioned numbness (23.4%) and dizziness (17.7%), but did not mention chest pain in the top five responses. Although an open-ended telephone survey by Mochari-Greenberger et al did not show any significant differences between races, symptom knowledge was found to be generally low. Similar to White participants, African American participants identified weakness (55%) and trouble speaking (44%) as stroke "warning signs" more frequently than severe headache (24%), dizziness (21%), and vision loss (14%).²⁶ These open-ended studies showed poorer symptom knowledge than close-ended studies overall, suggesting that close-ended questions may overestimate stroke knowledge.^{12,13} Nonetheless, studies using close-ended questions cannot be discounted, as recognition of stroke signs when they occur may be more important than spontaneous recall.

Taken together, these studies suggest poorer recognition of headache and visual symptoms of stroke in African Americans compared with Whites. Additionally, recognition of confusion or difficulty speaking is poor in African Americans and Whites; however this description of symptoms is not specific and may refer to aphasia, dysarthria, and/or neglect as

evidence of stroke. Future studies can help to further clarify where specific knowledge deficits exist.

Risk Factors

Knowledge of stroke risk factors may be important for motivating stroke prevention through risk factor screening/control and encouraging lifestyle modification for risk factor prevention.

Sallar et al found that African American residents of counties in the Mississippi Delta were more likely to select hypertension (90.4%), stress (82.4%), and hypercholesterolemia (71.3%) than tobacco use (61.7%) and diabetes (46.8%) as risk factors.²⁵ Willey et al found that while 87.3% African American participants identified hypertension as a risk factor, smaller proportions identified diabetes (53.8%) and tobacco use (42.3%). Among these three risk factors, racial differences only existed in the identification of tobacco use. Stress was not included as an incorrect option. In our study, 90% of participants incorrectly identified stress as the number one risk factor for stroke. Additionally, a higher proportion of participants identified hypertension, diabetes, and tobacco use (80%) as risk factors than sleep apnea, atrial fibrillation, and obesity (58.6%).¹⁴

Using open-ended questions, Biederman et al found that African American participants were most likely to name hypertension (39.8%), diabetes (9.7%) and poor nutrition (8.2%) as the top three risk factors for stroke.¹² Tobacco use, which was second most likely to be named by Whites (10.5%), was not

one of the top five risk factors identified by African Americans. Interestingly, 6.6% of African Americans named stress as one of the top three risk factors. Similarly, Fussman et al reported that while African Americans were most likely to correctly name hypertension (33.7%) and diet (33.1%) as important risk factors, Whites named hypertension (33.2%) and tobacco use (29.5%).²¹ Their study also found that stress was named by 33.6% of African Americans compared with 17.5% of Whites. A slightly different approach was taken by Pratt et al, who used open-ended questions to ask about "causes" of stroke and medical conditions contributing to stroke.¹³ While hypertension (58.5%), stress (29.3%), and diet (16.9%) were the most commonly identified causes of stroke, hypertension (59.3), heart disease (15.4), and diabetes (11.5%) were named as medical risk factors.

While fewer studies have addressed stroke literacy as it relates to risk factor knowledge, the literature suggests that African Americans are most likely to correctly identify hypertension as a major risk factor and less likely to identify diabetes and tobacco use. Racial disparities may exist in knowledge of tobacco use as an important risk factor for stroke. These studies also suggest that stress may be considered an important risk factor among African Americans. This perception of stress as a major risk factor for stroke may have implications for health behaviors directed toward recognized modifiable risk factors. For example, an individual's perception of the benefits of blood pressure

control or tobacco cessation may be lower if they believe that stress is an important factor that they have less power to control, thereby decreasing motivation for positive health behavior change. Alternatively, the recognition of stress as a risk factor by African Americans in higher proportions compared with Whites could be an indicator of an actual higher exposure to psychosocial stress in the African American

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population compared with Whites.

The finding that, compared with Whites, more African Americans consider stress an important risk factor deserves careful examination. Stress is a broad term, which may describe acute emotional stressors, sub-acute and chronic stressors of daily living, or even psychological states such as depression. Brotman et al described associations between these stressors and cardiovascular disease.²⁷ Recent studies have linked psychosocial distress and perceived stress to stroke risk.^{28, 29} More stud-

ies are needed to explore the contribution of stress and perceptions of stress to stroke risk. Differential exposure to stressors related to racially linked social disadvantage could help explain disparities in stroke knowledge, morbidity, and mortality.

Action for Stroke

African Americans are more likely to have delayed hospital arrival after the onset of stroke symptoms.³⁰⁻³² Early hospital arrival has implications for acute stroke treatment with tissue plasminogen activator (t-PA). A number of studies have investigated knowledge of appropriate action to take for signs of stroke. Most prior studies have shown that African Americans know the appropriate actions to take.^{7,12,13,17,20,22-24} However, when asked about actions for specific signs of stroke, individuals are generally less likely to choose the appropriate action.^{12,17} This may indicate a simultaneous understanding of appropriate actions when faced with the certainty of stroke and inability to recognize individual symptoms as stroke, culminating in an overall loss of self-efficacy when faced with the challenge of recognizing stroke upon actual occurrence.

Few studies have assessed knowledge of availability of tissue plasminogen activator (t-PA) for treatment of acute ischemic stroke. Using the Michigan BRFSS (2004) and open-ended questions, Anderson et al found racial disparities in awareness of t-PA and the time window for t-PA. Compared with 34.6% of White participants, only 20.4% of African Americans were

aware of t-PA. Furthermore, compared with 18% of Whites, 7% of African Americans were aware both of t-PA and the time window for treatment.³³ Using close-ended questions, Pratt et al found that 13.5% of participants were aware of t-PA, and that 59.9% were aware of a 3-hour time window.¹³ Further studies are needed to assess the current state of knowledge of t-PA and its time window for stroke treatment among African Americans.

Although most studies have not found disparities in knowledge of the appropriate action to take for stroke, symptom recognition and knowledge of the time window for t-PA administration may contribute to disparities in hospital arrival. Knowledge does not necessarily translate into action, and the contribution of other barriers such as health insurance status, concerns about costs of stroke treatment, and trust in the health care system should be further explored. Future educational campaigns should include information about the availability of t-PA and the time window for stroke treatment, provide tips and emphasis on recognizing symptoms, and address social and economic barriers to seeking acute care.

CONCLUSIONS

Our review of the literature suggests that, for African Americans, knowledge deficits exist within the different domains of stroke literacy. Knowledge of headache and visual symptoms is poor for African Americans. Knowledge of “confusion or

difficulty speaking” is also poor and may reflect a lack of recognition of dysarthria, aphasia, and/or loss of higher cortical functions. Hypertension is most likely to be identified as a risk factor by African Americans. However, knowledge deficits exist for recognition of tobacco use and diabetes as risk factors, and African Americans are more likely to name stress as an important risk factor for stroke. Finally, some limited data suggest that disparities exist for knowledge of time window for and availability of t-PA.

Disparities in knowledge identified in our review should be explored in future stroke literacy studies and addressed in educational campaigns targeting African American communities. Models of health behavior should be used to study how health beliefs and environmental influences affect the way knowledge translates into behavior. Finally, a standardized method for the assessment of stroke literacy is needed to aid in comparisons across populations and to allow for consistent ongoing data collection. This would also facilitate the implementation of studies to elucidate the relationship between stroke knowledge and behavioral and clinical outcomes.

CONFLICT OF INTEREST

No conflicts of interest to report.

AUTHOR CONTRIBUTIONS

Research concept and design: Sharrief, Urrutia; Acquisition of data: Sharrief, Johnson, Abada; Data analysis and interpretation: Sharrief, Johnson, Abada, Urrutia; Manuscript draft: Sharrief, Abada, Urrutia; Statistical expertise: Sharrief; Funding acquisition: Urrutia; Administrative: Sharrief, Johnson, Abada; Supervision: Urrutia

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