Ethnic and Racial Differences of Baseline Stroke Knowledge in a "Stroke Belt" Community

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Abstract:

Acute stroke is often a treatable condition; however, intervention is time dependent and typically should ensue within 3 hr from onset of symptoms. The ability of individuals to understand stroke risk factors to reduce individual risk and to recognize warning signs and symptoms of stroke as signals to initiate medical care is paramount to decreasing stroke-related morbidity and mortality. This descriptive study presents ethnic and racial differences of baseline stroke knowledge among residents (*n* = 1,904) of two North Carolina counties situated in the Stroke Belt. Findings suggest a global stroke knowledge deficit that is more pronounced among Hispanics. Future community stroke education campaigns need to consider various educational mediums and outlets to ensure inclusion of persons at highest risk for stroke. Suggestions are provided for possible content of future stroke knowledge and prevention campaigns.

Article:

Despite advances in diagnosis and treatment, stroke continues to be the third leading cause of death and a leading cause of long-term disability in the United States (American Heart Association [AHA], 2009). The individual, interpersonal, and societal burdens of stroke are well documented (VanHook, 2009). Direct and indirect costs associated with stroke are predicted to reach nearly $68.9 billion in 2009 alone (AHA, 2009). As a major contributor of morbidity and mortality, stroke is included as a focus area in the national health promotion and disease prevention guidelines framed in the national health objectives of Healthy People 2010 (U.S.

Department of Health and Human Services Office of Disease Prevention and Health Promotion, 2005).

Stroke, an interruption of blood supply to the brain, can be either ischemic or hemorrhagic in nature. Ischemic stroke is much more common, accounting for 87% of stroke in the U.S. population; intracerebral (10%) and subarachnoid (3%) hemorrhage make up the remainder (AHA, 2009). Advances in medical technology and pharmaceutical agents have transformed stroke from a condition guided by symptom management to an event with reduced morbidity and mortality through acute intervention. However, intervention is time dependent and for ischemic strokes ideally must ensue within a 3-hr window from onset of symptoms (American Stroke Association, 2009). The ability of individuals to recognize the risk factors and warning signs of stroke and to initiate appropriate response when confronted with suspected stroke or stroke symptoms is paramount to decreasing the morbidity and mortality that accompany stroke and furthering progress on national health goals.

Background

More than a decade has passed since pharmaceutical intervention of acute ischemic stroke was approved and a national symposium held to determine the best avenues for dissemination of this advancement to the medical, allied health, and general populations (National Institute of Neurological Disorders and Stroke, 1996). However, public knowledge of stroke risk factors and warning signs and what to do in cases of suspected stroke or when confronted with stroke signs and symptoms remains low. For instance, in an early community knowledge assessment, Pancioli and colleagues (1998) reported that only 57% of respondents in the greater Cincinnati, Ohio, area could name one of five established warning signs of stroke and that 68% could list only one stroke risk factor. A subsequent study in the same community found significant improvement in knowledge of stroke warning signs whereas risk factor knowledge lagged (Schneider et al., 2003). Reeves, Hogan, and Rafferty (2002) found that 80% of Michigan Behavioral Risk Factor Survey respondents could name one stroke risk factor and 70% could name one stroke sign; however, far fewer could name three of each (<30% and 14%, respectively). Knowledge assessments specific to rural communities (Blades et al., 2005), women (Christian, Rosamond, White, & Mosca, 2007; Ferris, Robertson, Fabunmi, & Mosca, 2005; Kattapong et al., 1998), and studies from abroad (Müller-Nordhorn et al., 2006; Nedeltchev, Fischer, Arnold, Kappeler, & Mattle, 2007; Yoon, Helller, Levi, Wiggers, & Fitzgerald, 2001) are all suggestive of generalized community-wide stroke risk factor and warning-sign knowledge deficits.

North Carolina, located in the "buckle of the stroke belt," has a stroke mortality rate 23% higher than the national average, ranking fourth in the United States (North Carolina Stroke Care Collaborative, 2008). North Carolina also has the fastest-growing Hispanic population in the nation; between 1990 and 2000, the North Carolina Hispanic population increased 394% (Silberman et al., 2003). Few studies report differences in stroke-related incidence and death

rates between Hispanic and non-Hispanic populations. However, Morgenstern et al. (2004) found a higher incidence of stroke in Hispanics (in this case Mexican Americans) than in non-Hispanic Caucasians and further suggested that Hispanics knew less about stroke risk factors and felt less able to prevent stroke.

In response to changing community demographics, the overarching goals of *Healthy People 2010*, which includes reducing health disparities, and the designation as a stroke-belt community, researchers at the University of North Carolina Greensboro (UNCG) and clinicians from medical systems in Guilford and Forsyth counties, North Carolina, formed a partnership designated as the Community Initiative to Eliminate Stroke (CITIES). CITIES, a 3-year project funded by the U.S. Department of Health and Human Services, Office of Minority Health (OMH), aimed to increase community awareness and knowledge of stroke with a focus on traditionally underserved and minority populations. Results of various elements of the CITIES project have been previously reported elsewhere (Miller et al., 2007). This study presents the findings from the baseline community awareness and knowledge survey.

Method

The current study is a baseline assessment of stroke knowledge in two North Carolina counties and was used to guide components of a larger health promotion campaign. In 2006, a randomized stratified sampling technique was used to contact households in Forsyth and Guilford counties by telephone to assess baseline knowledge of stroke. At the time of the survey, the two counties had a combined population of approximately 787,967 residents (U.S. Census Bureau, n.d.). Study inclusion criteria were as follows: must be at least 18 years of age, be English speaking, and have a landline telephone with a publicly listed telephone number. African Americans and Hispanics were intentionally oversampled using zip codes known to have a higher proportion of minority residents in efforts to meet the OHM study guidelines on inclusion of minority participants.

Participants

Of the households contacted, a total of 2,063 (Forsyth $n=1,031$, Guilford $n=1,032$) individuals participated in the study. Initial data cleaning resulted in 58 participants being dropped owing to age less than 18 years or no age entered, which yielded a total of 2,005 participants that met the criteria and were included in the initial data analysis. Participants were then dichotomized into Hispanic or non-Hispanic based on self-identified ethnicity. Non-Hispanics were further subcategorized as African American, Caucasian, or Other based on racial self-identification; Hispanics, non-Hispanic African Americans, and non-Hispanic Caucasians were included in all data analyses ($n = 1,904$).

Procedure

Census data were used to obtain zip codes of areas with higher proportions of minority populations. A list of phone numbers was generated within predetermined zip codes; participants were then randomly selected from the compiled phone numbers. A goal of a minimum 2,000 participants, of which 20% self-identified as Hispanic, was set. Trained telephone interviewers were hired to contact households. Households were contacted between February 15, 2006, and April 1, 2006. Callers were instructed to make three attempts when contacting eligible household members; subsequent contact attempts were made at various times of day. Once contacted, the participant gave oral consent prior to answering any questions, per procedures approved by the institutional review boards of UNCG and both representative health systems. Calls that resulted in participant ineligibility, refusal to participate, or that went unanswered were replaced with phone numbers randomized within the same zip code. During the survey, participants were unable to change answers once given.

Measures

A literature review of prior stroke community awareness surveys (Blades et al., 2005;Ferris et al., 2005; Pancioli et al., 1998; Reeves et al., 2002; Yoon et al., 2001) was conducted to aid with the construction of the utilized tool. The initial survey was pilot tested with a small sample of the priority population and modified to clarify potentially confusing questions. The final version of the survey consisted of a series of 19 questions pertaining to four unique categories: (a) stroke knowledge, (b) stroke prevention and treatment, (c) stroke information sources, and (d) participant demographics. The first section was designed to assess baseline stroke knowledge and was composed of three questions that included the following: in what area of the body does stroke occur, the top three risk factors for stroke, and the top three warning signs or first signs or symptoms of stroke. The second section, prevention and treatment, consisted of four items that inquired about initial response if someone is having a stroke, initial response to symptoms often associated with stroke, and also individual action(s) taken within the past year and what people in general can do to reduce their chances of having a stroke. The third section referred to stroke information sources and contained three questions asking how an individual learned about stroke, places that provide stroke prevention services, and where one has seen or heard advertisements and/or notices on how to prevent a stroke from occurring. The last section consisted of nine demographic questions directly asking the participant's age, sex, race, ethnicity (Hispanic or non-Hispanic), medical care coverage (yes or no), insurance type (governmental or private), level of education, and current height and weight.

Data Analysis

Data analysis was performed using SPSS 16.0 for Windows (SPSS Inc., Chicago, IL). As per OMH guidelines, gathered data included participant's ethnicity and race. Baseline knowledge of stroke was assessed by responses to three open-ended questions: "In what area of the body does stroke occur?" "What are the top three risk factors for stroke?" and "What are the top three warning signs or the first signs or symptoms of stroke?" Baseline knowledge of stroke treatment

was assessed by responses to "What is the first thing you would do if you thought you or someone you were with was having a stroke?" and "If you experienced sudden difficulty speaking, reading, or understanding that would not go away, what is the first thing you would do?" Descriptive statistics were used to identify the relationships between self-identified ethnicity and race and baseline knowledge of location, risk factors, warning signs, and initial responses to stroke.

Results

The sample (n = 2,005) included 58.2% Caucasian, 26.9% African Americans, 3.0% Asian/Pacific Islander, 1.0% American Native, 10.3% who did not identify with any of the previous mentioned groups, and 0.6% who refused to answer. The African American and Caucasian participant representation was similar to the combined county population racial-mix averages at the time of survey (28% and 63.7%, respectively; U.S. Census, 2005). As anticipated, Hispanics were overrepresented in the sample, with 20.4% of participants self-identifying as Hispanic whereas census data suggested that the combined county average Hispanic population was 7.65% (U.S. Census, 2005). Participant overall mean age was 51.6 years (SD ± 17.7), and 68.7% were female. Many participants indicated they had completed high school or equivalent (35.3%), with an additional 24.1% indicating they had attended 1 to 3 years of technical school or college and 26.2% stating they had completed 4 or more years of college.

Baseline stroke knowledge is depicted in Tables 1 to 3. The majority of non-Hispanic participants (71.2%) correctly identified the area of the body where stroke occurs as the "brain" or "head." However, the majority of Hispanics (67.7%) identified the "heart" as the bodily location of stroke (Table 1; $p < 0.001$). Of the sample, a total 8.6% of participants gave the initial response of "Don't know" to this question (Hispanics, 5.6%; African American, 13.5%, Caucasian, 7.1%). When asked, "What are the top three risk factors for stroke?" variation by ethnicity and race was noted (Table 2). For example, the primary initial stroke risk factor reported by Hispanic participants was "blood vessel disease" (21.5%), whereas both non-Hispanic African Americans and non-Hispanic Caucasians answered "high blood pressure" (39.8% and 37.5%, respectively). A full 11.2% of participant's primary response was don't know, or no answer was given to this question, which included 18.1% of Hispanics, 8.2% of non-Hispanic African Americans, and 9.9% of non-Hispanic Caucasians. Table 3 highlights the five most common initial responses to "What are the top three 'warning signs' or symptoms of stroke?" A total 14% of respondents gave the initial response of "Don't know" or did not provide an answer, including 23.7% of Hispanics. In addition, 17.6% of Hispanics gave "chest pain" as their initial response to this question. Results displayed in Tables 1 to 3 suggest baseline stroke knowledge as generally low among all participants but particularly low among Hispanics.

Table 1 Responses to "In What Area of the Body Does Stroke Occur?"

	Non-Hispanic (n = 1,495)

Area of Body	Hispanic (n = 409)	African American (n = 535)	Caucasian (n = 960)
Brain	72 (17.6)	231 (43.2)	594 (61.9)
Head	35 (8.6)	88 (16.4)	152 (15.8)
Heart	277 (67.7)	71 (13.3)	100 (10.4)
Don't know	23 (5.6)	72 (13.5)	68 (7.1)
Other	2 (0.5)	73 (13.6)	46 (4.8)

Note: Values are n (%).

Table 2 Top Five Most Common Initial Responses to "What Are the Top Three Risk Factors[a] for Stroke?"

		Non-Hispanic (n = 1,495)	
Rank	Hispanic (n = 409)	African American (n = 535)	Caucasian (n = 960)
1st	Blood vessel disease 88 (21.5)	High blood pressure 213 (39.8)	High blood pressure 360 (37.5)
2nd	Don't know or no answer 74 (18.1)	Diabetes 52 (9.7)	Smoking 101 (10.5)
3rd	High blood pressure 63 (15.4)	Diet, poor diet, or nutrition 44 (8.2)	Don't know or no answer 95 (9.9)
4th	Diabetes 55 (13.4)	Don't know or no answer 44 (8.2)	Overweight, obesity 62 (6.5)
5th	Lack of exercise 22 (5.4)	Stress 33 (6.2)	Blood vessel disease 59 (6.1)

Note: Values are n (%).
a Established stroke risk factors include (a) nonmodifiable—age, heredity (family history) and race, sex (gender), prior stroke, transient ischemia attack, or heart attack; and (b) modifiable—high blood pressure, cigarette smoking, diabetes mellitus, carotid or other artery disease, atrial fibrillation, other heart disease, sickle cell disease, high blood cholesterol, poor diet, physical inactivity, and obesity (American Stroke Association, 2009).

Table 3 Top Five Most Common Initial Responses to "What Are the Top Three Warning Signs[a] or the First Signs or Symptoms of Stroke?"

	Non-Hispanic (n = 1,495)		
Rank	Hispanic (n = 409)	African American (n = 535)	Caucasian (n = 960)
1st	Don't know or no answer 97 (23.7)	Numbness of one side 129 (24.1)	Numbness of one side 225 (23.4) of the body or face of the body or face
2nd	Chest pain 72 (17.6)	Dizziness 93 (17.4)	Dizziness 170 (17.7)
3rd	Dizziness 70 (17.1)	Chest pain 63 (11.8)	Don't know or no

			answer 117 (12.2)
4th	Numbness of one side 53 (13.0)	Don't know or no answer 53 (9.9)	Severe headache 86 (9.0) of the body or face
5th	Difficulty understanding 44 (10.8)	Severe headache 44 (8.2)	Slurred speech 79 (8.2) or slurred speech

Note: Values are n (%).
a Established signs of a stroke: numbness or weakness of the face, arm, leg, especially on one side of the body; sudden confusion, trouble speaking or understanding; sudden trouble seeing in one or both eyes; sudden trouble walking; dizziness; loss of balance or coordination; sudden, severe headache with no known cause (American Stroke Association, 2009).

Knowledge related to stroke treatment, represented by participants' initial responses to someone having a stroke, is presented in Table 4. When asked, "What is the FIRST THING you would do if you thought you or someone you were with was having a stroke?" more than 90% of participants across ethnicities and races initially responded, "Call emergency rescue service or 911/ambulance." The second most common initial response among Hispanic participants was "Call doctor" (2.4%), whereas non-Hispanic African Americans and non-Hispanic Caucasians had mixed responses that fell into the category of "Other." The top three "Other" responses for both non-Hispanic African Americans and Caucasians included taking or giving aspirin, comfort measures that included praying, and answers that included initiating some type of emergency response in a sequence (e.g., push my panic button, pray for person, then call 911). Table 4 also presents participants' ability to recognize some general stroke signs and symptoms by initial responses to the question "If you experienced sudden difficulty speaking, reading, or understanding that would not go away, what is the FIRST THING you would do?" The majority of participants across all three ethnic/racial groups gave "Call emergency rescue service or 911/ambulance" as their primary initial response; however, Hispanics gave this response more often (91%) as compared to non-Hispanic African Americans and non-Hispanic Caucasians (68.8% and 68.2%, respectively). In addition, all three ethnic/racial groups' second highest initial response was "call doctor"; however, non-Hispanic African Americans and non-Hispanic Caucasians were more likely to offer this response (15.9% and 13.8%) than their Hispanic counterparts (4.6%).

Table 4 Knowledge of Stroke Treatment and Ability to Recognize Stroke

		Non-Hispanic (n = 1,495)	
Rank	Hispanic (n = 409)	African American (n = 535)	Caucasian (n = 960)
"What is the FIRST THING you would do if you thought you or someone you were with was having a stroke?"			
1st	Call 911a 385 (94.1)	Call 911a 482 (90.1)	Call 911a 874 (91.0)
2nd	Call doctor 10 (2.4)	Other 20 (3.7)	Other 32 (3.3)

3rd	Go to hospital 9 (2.2)	Go to hospital 11 (2.1)	Go to hospital 24 (2.5)
"If you experienced sudden difficulty speaking, reading, or understanding that would not go away, what is the FIRST THING you would do?			
1st	Call 911a 372 (91.0)	Call 911a 368 (68.8)	Call 911a 655 (68.2)
2nd	Call doctor 19 (4.6)	Call doctor 85 (15.9)	Call doctor 132 (13.8)
3rd	Go to hospital 9 (2.2)	Call spouse or family member 19 (3.6)	Go to hospital 43 (4.5)

Note: Values are n (%).
a "Call emergency rescue service or 911/ambulance."

Discussion

The findings of this community-based study suggest a deficit of stroke knowledge and treatment in two central North Carolina counties, a geographic area known to have an exceedingly high incidence of stroke. This knowledge deficit appears greatest among Hispanics, the most rapidly growing ethnic group in this area. More than two thirds of Hispanics sampled did not know the location of the body where stroke occurs, 18% could not list one risk factor, and 23.7% could not list one warning sign. However, non-Hispanic African Americans and non-Hispanic Caucasians displayed suboptimal knowledge of stroke risk factors and warning signs as well.

"Heart" was identified as the area of the body where stroke occurs by 23.7% of total participants, including the majority of Hispanics (67.7%), indicating potential confusion between heart attack and stroke. In their urban Australian study, Yoon et al. (2001)found that 15.9% of respondents identified stroke as a heart problem, with 9.9% identifying chest pain or chest tightness as a stroke warning sign. Similarly, 9.2% of respondents in a Michigan statewide sample named pain in chest or arm (Reeves et al., 2002) and 6% of respondents in a Cincinnati-based study named chest pain as stroke warning signs (Pancioli et al., 1998).

"Blood vessel disease" was the most common risk factor listed by Hispanics (21.5%), followed by "Don't know or no answer" (18.1%). This finding too may represent confusion between heart attack and stroke, as both heart attack and stroke are attributable to blood vessel disease. Also interesting, only 15.4% of Hispanics listed high blood pressure initially when prompted for stroke risk factors and, furthermore, named only one risk factor, "Lack of exercise" (5.4%), in their top five initial responses that was not disease related. This contrasts with previous studies in the United States (Reeves et al., 2002; Schneider et al., 2003) and abroad (Cheung et al., 1999; Kim & Yoon, 1997; Müller-Nordhorn et al., 2006) where hypertension was the most common risk factor stated followed by a risk factor that does not necessarily necessitate medical intervention such as smoking or obesity. In their recent study, Christian et al. (2007) found Hispanic women more likely to perceive cardiovascular disease (including stroke) as being nonpreventable. These findings suggest that stroke educational campaigns targeted toward Hispanics should focus on established risk factors and further differentiate between those that are

nonmodifiable, those dependent on medical intervention, and those potentially influenceable at the individual level.

Stroke warning sign knowledge was low among Hispanic respondents, with 23.7% initially responding with "Don't know or no answer." This finding is particularly troubling as warning signs (i.e., symptoms) are what typically prompt individuals to seek medical attention. In their follow-up to an earlier study, Schneider et al. (2003) found a significant increase in public knowledge of stroke warning signs over a 5-year period mostly attributed to mass media, namely television. Müller-Nordhorn and colleagues (2006) found mass media to be the most common source of stroke information as well. However, as these researchers and others (Christian et al., 2007; Ferris et al., 2005; Pancioli et al., 1998; Reeves et al., 2002) have noted, persons in groups with the highest incidence of stroke tend to have the lowest levels of stroke knowledge.

When asked the first thing they would do if they thought they or someone they were with were having a stroke, the majority of respondents indicated they would "Call emergency rescue service or 911/ambulance" (Hispanic 94.1%, non-Hispanic African American 90.1%, non-Hispanic Caucasian 91%). However, when asked the first thing they would do when given stroke symptoms, the number of correct responses was lower (91.0%, 68.8%, and 68.2%, respectively). This finding suggests that "sudden difficulty speaking, reading or understanding" may not be recognized as stroke signs and symptoms. In their rural Montana study, Blades et al. (2005) found that 76% of respondents would "Call 911" if they thought someone was having a stroke; however, initial responses varied widely when participants were presented with stroke symptoms. This same phenomenon has been observed in Australia (Yoon et al., 2001) and Switzerland (Nedeltchev et al., 2007), suggesting a generalized lack of understanding of stroke symptoms. Furthermore, Hispanics' response indicating greater use of emergency services in both cases may be indicative of a lack or underutilization of primary care in the Hispanic community rather than increased stroke knowledge.

Limitations

Limitations of our study include that our sample population contained only individuals with a landline phone and a publically listed telephone number. This potentially reduced contact with younger people (Aoki & Downes, 2003) and immigrant or first-generation Latinos (Leonardi, 2003) who consider cell phones more economical than landlines and, thus, may use them more frequently. In addition, phone interviews were only conducted in English. Although Hispanics were oversampled for this survey, they were not afforded the opportunity to take the survey in Spanish. DuBard, Garrett, and Gizlice (2006) found a significant disparity in stroke knowledge among Hispanics with limited English proficiency. Assessing baseline stroke knowledge in Spanish and languages other than English may demonstrate greater stroke knowledge disparity.

Conclusions

Despite these limitations, results of this study contribute to the existing literature on baseline stroke knowledge among various racial and ethnic groups in a stroke belt area. This study demonstrated that stroke knowledge is suboptimal among Hispanics, non-Hispanic African Americans, and non-Hispanic Caucasians in Guilford and Forsyth counties, North Carolina. However, this knowledge deficit is more pronounced among Hispanics. Furthermore, there is significant confusion between heart attack and stroke. Future educational campaigns should aim to differentiate between heart attack and stroke as certain initial actions (e.g., taking or giving aspirin) are not appropriate in both cases. In addition, consideration to the various educational mediums and information outlets used by individuals in the groups at highest risk for stroke (e.g., the elderly, ethnic and racial minorities, men) should be given high priority.

Article Notes

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