THE ASSOCIATION BETWEEN RACE AND STROKE PREVALENCE IN A PATIENT COHORT IN MISSISSIPPI

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The Association Between Race and Stroke Prevalence in a Patient Cohort in Mississippi

By Christopher Ashley, MHIIM, RT(R)(ARRT), and Shamsi Daneshvari Berry, PhD, MS, CPHI

Abstract

The risk factors for stroke, including hypertension, high cholesterol, heart disease, diabetes, heavy alcohol use, and prior history of stroke, are well known. In Mississippi, there is often a wider gulf of socioeconomic disparities between racial groups than in other regions within the United States. This increases the effect of these disparities in minority populations. The goal of this research is to determine whether there is an increased risk of stroke prevalence in the black community than in the white population.

The odds ratio of 1.5 (CI 1.3818 – 1.5591) was returned for this analysis. White patients diagnosed with stroke represented 38 percent of the cohort while black patients totaled 62 percent of this cohort. There is a higher prevalence of stroke in the black population compared to the white population in this study cohort. The importance of this finding is apparent upon consideration of deficiencies in the management of risk factors.

Note: The University of Mississippi Medical Center Patient Cohort explorer database search used for this study uses a data filter set for ‘black’ or ‘African-American’ in the search query. This study includes those patients designated ‘black’ or ‘African-American’ admitted with stroke at the University of Mississippi Medical Center. For clarity, this cohort will be identified in this paper as ‘black Americans.’

Keywords: Stroke, minorities, risk factors

Introduction

Someone suffers a stroke about every 40 seconds in the United States and over 140,000 deaths result from stroke annually. It is the leading cause of long-term disability in the United States.¹

Stroke is a neurologic impairment of the central nervous system that is usually caused by a cerebral infarction or a hemorrhage. A stroke occurs when a blood vessel carrying oxygenated blood to the brain either clots or bursts. When this happens, the oxygen carrying blood in the clotted or ruptured vessel cannot get to the brain, causing brain cells to die.

The effects of stroke on the human body are as numerous as the causes. There are several different types of stroke, including ischemic, hemorrhagic, transient ischemic attack (TIA), cryptogenic stroke, and stroke of the brain stem.

Ischemic stroke accounts for 87 percent of all strokes. This type of stroke occurs due to the development of fatty deposits along the walls of blood vessels, which is known as atherosclerosis. A
hemorrhagic stroke, or a bleed, happens when a weakened blood vessel bursts. This type of stroke accounts for 13 percent of all strokes. The resulting bleed causes pressure on the tissue surrounding the brain.

There are also two types of hemorrhagic stroke—intracerebral and subarachnoid. A transient ischemic attack (TIA), otherwise known as a “mini stroke,” is a warning of a major stroke, and occurs when oxygenated blood flow to the brain becomes temporarily blocked. Since this type of stroke causes no permanent damage it is often ignored, which can prove fatal. Although strokes are usually caused by blockage of blood flow to the brain, the cause of strokes cannot always be determined.

In these cases, a stroke is classified as cryptogenic. In this instance, the healthcare team must investigate further in order to effectively diagnose the patient and prevent a further episode of stroke. This may require a team of physicians including neurologists, cardiologists, and electrophysiologists to work together in order to make a definitive diagnosis.

Finally, a stroke which manifests in the brain stem of a patient can have multiplex symptoms which leads to difficulty in forming a definitive diagnosis. Since the brain stem controls all major motor activities, this type of stroke can impair some, if not all of these functions.

Background

Stroke is the second leading cause of death after heart disease worldwide and contributes to almost 12 percent of all deaths. Eight-hundred thousand people suffer a stroke each year in the United States. From this number, over 600,000 patients suffer their first stroke, and 185,000 have a recurrent stroke. Stroke is the leading cause of disability in the United States and is associated with poor mortality outcomes. Despite these statistics, the contemporary literature associated with the prevalence of stroke along racial and ethnic lines is limited.

A report issued in 2014 by the Mississippi State Department of Health noted trends in chronic conditions in the state including costs. Stroke is among the top 10 chronic diseases in the state in hospital discharges at 1.6 per 1,000 discharges. It is also among the costlier diseases, with an estimated 131 million in hospital discharge costs reported in 2010 in Mississippi.

In addition, socioeconomic disparities in Mississippi are often greater than the rest of the United States. The total black population in Mississippi is 38 percent. Thirty-five percent of the black population lives below the poverty level compared to 13 percent of the white population.

Additionally, the black unemployment rate is double that of the white population. The black population also faces disparities in educational level with the percentage of this group having only completed high school double that of the white population.

Another factor affecting healthcare for the black population is health insurance. Almost 21 percent of
black Americans do not have health insurance compared to 15 percent of the white population. The black American population has greater mortality rates than the white population for almost every significant risk factor for stroke in Mississippi. The mortality rate of hypertension for black Americans in Mississippi in 2012 was 25.2 versus only 11.3 individuals out of 100,000 for the white population. Heart disease mortality rates were recorded at 264.0 for black Americans in comparison to 230.9 out of 100,000 white individuals. In the category of stroke, the rate for black Americans was 65.2 versus 47.1 per 100,000 individuals in Mississippi in 2012.

In 2008, a study by the Mississippi Institutions of Higher Learning highlighted the socioeconomic disparities between black Americans and the rest of the population in Mississippi. During the timeframe of this study, black Americans earned just under 70 percent of the median salary of the white population. The median household income of black Americans in 2006 was $21,969, just over 50 percent of the median household of white Mississippians at $43,139. This disparity of lower household income in the black community results in a wealth gap.

During a period from 1999-2006 just over one quarter of black-owned homes valued at more than $70,000, whereas 60 percent of the white population did own homes valued at greater than $70,000. Although the poverty rate in Mississippi has declined since 1990, from 25 percent to 21 percent, lower levels of higher education in the black community still affect progress toward lowering the overall poverty rate. In 2006, approximately 22 percent of the white population obtained a college degree in comparison to 12 percent of black Americans.

The significance of higher stroke rates in the black community is increased by the fact that this population have an earlier onset of stroke and greater mortality rates than the white population. Black Americans also suffer more severe strokes and have a more difficult recovery after a stroke. There is also a link between race and ethnic factors and the area of residence, which is also a contributor to suboptimal stroke recovery outcomes in black Americans. The southeastern United States is sometimes referred to as the "stroke belt." The black American population in this region is proportionally higher than the regional population in the northern and western United States.

The Wide-Spectrum Investigation of Stroke Outcome Disparities on Multiple Levels (WISDOMM) Center, located in Charleston, SC, lies in what is known as the "stroke buckle" of the "stroke belt." Stroke mortality rates in this area are the highest in the nation. Past studies related to stroke rates in South Carolina demonstrate that acute stroke outcomes are poorer among black Americans than whites in every age group.

State research here has also shown that the risk of having another stroke, heart attack, or death was higher for black Americans than for the white population. Research into age and race trends for stroke hospitalization also show that while stroke rates declined for both populations over age 65, rates for those under age 65 increased 17 percent for black Americans but showed no increase for
this age group in the white population.6

The goal of this research study is to determine the prevalence of stroke in the black American population in comparison to that of the white population in a cohort of Mississippi patients.

**Methods**

The University of Mississippi Medical Center Patient Cohort Explorer, a database housing de-identified information on over 27 million patient encounters for a total of 800,000 patients from January 1, 2013, to March 31, 2019, was utilized for this research study.

The database covers a comprehensive network of health facilities including six hospitals and over 30 clinics representing 125 specialties. This database allows for search queries with patient, encounter, and data filters on a comprehensive set of procedures, medications, labs, and diagnoses for this patient data. These search queries can be further analyzed and filtered by patient demographics, admission information, and emergency department visit data.

Using these filters, a patient diagnosis grouping of stroke was used in conjunction with an encounter diagnosis group setting of stroke. An encounter setting was also used for a procedure – assess and document stroke scale upon admission to the floor. The stroke scale was designed by the National Institutes of Health.

The National Institutes Stroke Scale (NIHSS) is used as a clinical stroke assessment tool for evaluating and documenting the neurologic condition of a patient who has suffered a stroke. This evaluation can also help determine lesion size and the severity of a stroke. It can also be used to predict the short and long-term prognosis of a stroke.7

Although these are the primary factors for which the NIHSS was designed, it can also help isolate an actual stroke from stroke mimics, including recent seizure, hypoglycemia, and migraine headache. The factors which are associated with a higher risk of a stroke mimic include younger age, a history of cognitive impairment, and abnormal physiologic findings without a neurologic cause.8

For these reasons, the stroke scale setting was used in this research to ensure a higher degree of accuracy in those patients diagnosed with stroke. Data filters were then set for patient demographic information to include in the search query—black or African-American, and White or Caucasian. Using the data table for patient encounter details, demographic information filters were placed for age, first race, and sex.

This research only included black and white populations within the cohort. The remainder of the population groups available in the database—American Indian or Alaska Native, Asian, Hispanic, Mississippi Band of Choctaw Indian, Native Hawaiian or other Pacific Islander—were excluded from this research due to the limited number in each group available for analysis. A cohort of 4,777
patients was returned for the search query for patient encounters between January 1, 2013, and March 31, 2019.

Chi-square and odds ratio analysis was performed on the data returned from the search query in the patient cohort explorer using SAS software.

Results

The age of patients represented in this research was 15 to 89 years. Male patients comprised 51.3 percent of the study with 2,451 patients, while female patients totaled 2,326 patients at 48.7 percent. The white group in this cohort contained 1,795 patients diagnosed with stroke (37.6 percent) with a mean age of 64.8 years. The black group contained 2,982 patients diagnosed with stroke (62.4 percent) with a mean age of 54.8 years. The overall mean age for this cohort was 60.8 years. The sample size for this study was 685,458. Statistics for each population group are presented in Table 1.

The following chi-square analysis was performed using SAS software Release 3.7.9. The chi-square p-value is 0.0001, which is less than alpha 0.05. Our null hypothesis that the number of black Americans with stroke is statistically equal to the white population with stroke is rejected in favor of the alternative hypothesis that the proportion of stroke in both populations is not statistically equal. The percentage of black patients diagnosed with stroke in this cohort is approximately 62 percent while the percentage of white patients diagnosed with stroke is approximately 38 percent. The odds ratio for the black population is 1.5 (CI 1.3818 – 1.5591).

Discussion

The findings of this research show that there is a significant statistical difference in the stroke prevalence for the black population versus the white population in this cohort. The proportion of stroke in the black group is almost a quarter higher than that of the white population in this sample. The odds ratio of 1.5 (CI 1.3818 – 1.5591) indicates a higher ratio for the black group than the white representation in this cohort. This indicates an increased likelihood that a black individual will have a stroke in comparison to a white individual. This evidence reflects trends in the national population. The known health risk factors for stroke in any population, including hypertension, heart disease, and high cholesterol, are recognized as primary concerns for providers attention in order to minimize the occurrence of stroke.

However, the socioeconomic disparities faced by many minority populations in the United States, which ultimately may lead to the risk factors of stroke, may not garner the attention needed to manage and minimize the occurrence of stroke in these populations.

The overall prevalence of stroke is expected to increase from 3.2 percent in 2012 to 3.9 percent by 2030. The costs of medical care that will be linked to stroke is estimated to increase approximately 2.5 times by during this same period. The issue is that these costs are not expected to be spread evenly across racial lines. Although stroke rates are decreasing in whites, the opposite is happening
for blacks.

In addition to the aforementioned risk factors in minority populations of high blood pressure, high cholesterol, diabetes, and heart disease, many individuals in these minorities are less inclined to use emergency medical services after suffering a stroke, and often do not receive medication for the secondary prevention of an additional stroke. Lower average income also plays an important role, as does lower awareness of what contributes to stroke, the symptoms of stroke, the importance of finding medical attention quickly, and preventive measures that can minimize the risk of stroke. Only 51 percent of the population arrives at the hospital in an ambulance. This reduces the chance of an individual receiving early thrombolytic therapy that can improve outcomes.\textsuperscript{10-11}

With the probability increasing that black Americans will suffer a stroke due to unmanaged risk factors and socioeconomic disparities, it is imperative that initiatives are implemented to bring awareness of this issue to the black community and other minority groups that face increased stroke rates.

In 2013, the National Institute for Neurological Disorders and Stroke (NINDS) announced the issue of grants focused at alleviating the risk and subsequent effects of stroke in racial and ethnic minority groups in the United States. NINDS also created the Stroke Prevention/Intervention Research Program (SPIRP), which allocated a total of $40 million over the course of five years at four project centers throughout the U.S. in New York, California, and Florida. SPIRP projects include health interventions designed to control high blood pressure, the delivery of home care for stroke patients aimed at preventing a further stroke, and a study aimed at the recognition of the reasons for growing stroke rates in young black Americans.\textsuperscript{11}

In Mississippi there have been some initiatives aimed at preventing stroke in disadvantaged populations. In 2010, a partnership was formed with the Centers for Disease Control and the Mississippi State Department of Health. The Mississippi Delta Health Collaborative is the result of this partnership and is geared toward reducing the risk of heart disease and stroke through a combination of public health initiatives, new legislative policies, health education, and environmental and system changes in affected populations in the 18-county Mississippi Delta region, one of the poorest areas in the United States.

Nearly 32 percent of this region is below the poverty line, and 50 percent is composed of black Americans who are particular at risk from socioeconomic health disparities. Additionally, the black population is 37 percent of the total population in the state, against only 12.6 percent nationally. This collaborative uses a wide spectrum of health workers including pharmacists, community health officials, faith-based representatives, and barbers in order to combat these disparities and improve outcomes for the population in this part of Mississippi. This collaborative uses the ABCS method to achieve better outcomes in these communities—aspirin therapy, blood pressure control, cholesterol
control, and smoking prevention and cessation.  

The results of this research were expected in that the black community faces significant health and socioeconomic disparities, which predisposes this population to higher stroke rates due to inadequate management of risk factors that lead to stroke in comparison to the white population, on both the local and national levels.

**Conclusion**

This research indicates that underserved populations such as the black population represented in this study are at a higher risk for stroke than their white counterparts. The importance of the management of the primary risk factors for stroke in all populations, but particularly in the black community—hypertension, heart disease, and high cholesterol, is clear.

With the knowledge of the disparities of minority populations like the black community, and the higher risk of stroke they face due to these disparities, it is vital that the healthcare community continue to be proactive in mitigating the risk factors that cause stroke in these disadvantaged communities. Programs such as the Mississippi Delta Health Collaborative show promise for improved outcomes in these populations.

**Notes**


**Author Bios**

Christopher Ashley, MHIIM, RT(R)(ARRT) ([cashley@stdom.com](mailto:cashley@stdom.com)) is a staff radiologic technologist at St. Dominic Health Services in Jackson, MS.

Shamsi Daneshvari Berry, PhD, MS, CPHI ([shamsi.berry@med.wmich.edu](mailto:shamsi.berry@med.wmich.edu)) is assistant professor of Biomedical Informatics at Western Michigan University.

**Appendix**

**Table 1**

<table>
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<th>Stroke</th>
<th>No Stroke</th>
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