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Comparing Echocardiograms of Haitian and non-Haitian Stroke Patients

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Abstract: Introduction. Haitian stroke patients had higher diastolic and mean arterial blood pressures, compared with non-Haitian controls. Therefore, we hypothesized that Haitians would have a higher prevalence of left ventricular hypertrophy and decreased ejection fraction. Methods. Using the Haitian Stroke Database, a cohort study was conducted. The following transthoracic echocardiographic parameters of 52 Haitians and 111 non-Haitians were compared: left ventricular hypertrophy; ejection fraction; right and left ventricular internal dimension at diastole; and left atrial size. Results. Left ventricular hypertrophy and decreased ejection fraction were more prevalent among Haitians (78% vs. 63%; p=.062 and 21% vs. 13%; p=.173, respectively). Neither reached statistical significance. Left atrial enlargement was significantly more prevalent among non-Haitians (36% vs 15%; p=.007). Conclusions. Left ventricular hypertrophy and decreased ejection fraction were more prevalent in Haitians, but neither finding reached statistical significance. Larger samples are needed for further understanding of stroke comorbidities in Haitians.

Key words: Stroke, echocardiography, Haiti, Haitian, African continental ancestry group, hypertrophy, left ventricular, heart atria, ejection fraction, stroke volume.

*Indicates shared first authorship

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Stroke is a leading cause of death and emergency room admissions in Haiti. Florida is home to the United States’ largest Haitian population; South Florida is home to the largest community of the Haitian diaspora.

Despite the large Haitian population in the United States, few studies have investigated stroke in Haitians living in the U.S. In 2019, Sirutis et al. created the Haitian Stroke Database and conducted a comparative case series. The researchers found that Haitian stroke patients, compared with non-Haitian controls, were younger, had higher diastolic and mean arterial blood pressures, and higher hemoglobin A1C values. In addition, Haitians were almost 80% less likely to have Medicare or private insurance. All of the findings were statistically significant. Another study found that Haitian-born patients living in Miami had a high prevalence of intracranial atherosclerosis. These factors predispose patients to strokes. Moreover, previous studies found that the etiology of stroke in African Americans is more likely rooted in the intracranial vessels, whereas the etiology of stroke in non-Hispanic Whites is more likely rooted in the extracranial vessels.

Transthoracic echocardiograms are routinely performed in stroke patients to determine a possible cardiogenic source of stroke. Due to their higher diastolic blood pressures and mean arterial pressures, we hypothesized that Haitian stroke patients would have a higher prevalence of left ventricular hypertrophy and decreased ejection fraction compared with their non-Haitian counterparts.

Methods

A historical cohort study was conducted to investigate echocardiographic differences between Haitian and non-Haitian stroke patients.

Selection and description of participants. The Haitian Stroke Database contained a total of 216 stroke patients, 72 Haitian and 144 non-Haitian controls who were treated at Baptist Hospital of Miami, Florida between January 2008 and August 2014. The non-Haitian controls were matched for sex and stroke type (i.e., hemorrhagic and ischemic), but were otherwise randomly selected. From this database, a secondary echocardiographic dataset was created. One hundred and sixty-three of the 216 patients had echocardiograms; the 53 patients without echocardiograms were excluded from further study. When patients had more than one echocardiogram performed during their hospital stay, the echocardiogram performed closest to time of admission was studied. There were a total of 52 Haitians and 111 non-Haitians with echocardiograms. Echocardiogram reports differed in both format and content. Some were more qualitative (30%), while others which were more quantitative (70%).

In an effort to consolidate the different report types, all continuous variables were transformed into binary categorical variables, using the normal range as established by the echocardiogram report. For the quantitative echocardiograms, the parameter was coded using the reference ranges in the echocardiogram reports. Left atrial enlargement was defined as >4.0 cm. Abnormal right and left ventricular sizes were defined as < 0.9 cm or > 2.6 cm right ventricular internal dimension at diastole and < 3.5 cm or > 5.7 cm left ventricular internal dimension at diastole. Decreased ejection fraction was defined as <50%. For the qualitative echocardiograms, if the parameter was explicitly
described as normal, it was listed as such. If it was described as abnormal (e.g., enlarged, hypertrophied) it was coded that way.

Echocardiogram reports were reviewed manually, and each relevant outcome was put into the database.

**Missing data.** Patients whose echocardiogram reports were missing information of the specific outcome(s) being measured were excluded from further analysis of that outcome. The final sample sizes for each outcome differed as follows: left ventricular hypertrophy (n=148); ejection fraction (n=161), right ventricular internal dimension at diastole (n=151); left ventricular internal dimension at diastole (n=149); and left atrial diameter (n=163).

**Statistics.** The study sample was assessed for baseline characteristics such as age, sex, and several comorbid conditions. Data were analyzed using Stata MP 16. A Chi-squared test was used to analyze the association between potential confounders and the exposure, as well as the outcome.

**Results**

Table 1 shows the baseline characteristics of the sample according to Haitian or non-Haitian ethnicity. Haitian stroke patients were younger, but in this smaller echocardiographic dataset, it did not reach statistical significance. The racial makeup of the Haitian group was mostly Black or African American (86.3%), while the non-Haitian group was predominantly White (86.4%). The percentage of patients with Medicaid or with no insurance was significantly higher among Haitians than among non-Haitians, while the opposite was observed for Medicare.

Table 2 shows the echocardiographic features according to ethnicity. Left ventricular hypertrophy and decreased ejection fraction and were more prevalent in the Haitian patients (78% vs. 63%; p=.062, and 21% vs. 13%; p=.173, respectively), but the difference did not reach statistical significance. Regarding right and left internal dimension at diastole, there were no differences between the two groups. Left atrial enlargement was more prevalent among non-Haitians than Haitians (36% vs 15%, rate difference –20.7%, 95% CI –33.9% to –7.4%, p=.007).

**Discussion**

Few studies exist on stroke in Haitian populations living in the United States. We used the Haitian Stroke Database created by Sirutis et al. to evaluate the relationship between Haitian ethnicity and selected echocardiographic characteristics. A discussion of each of these findings is presented below.

**Left ventricular hypertrophy.** Di Tullio et al. concluded that left ventricular hypertrophy is associated with an increased risk of ischemic stroke across White, Black, and Hispanic patients, with concentric hypertrophy carrying the greatest stroke risk. Kizer et al. found that African Americans with a prior stroke or transient ischemic attack had a higher prevalence of left ventricular hypertrophy than did their White counterparts. We hypothesized that Haitians would have an increased rate of concentric hypertrophy compared with non-Haitians. However, not all echocardiograms specified the pattern
Echos of Haitian and non-Haitian stroke patients

Table 1.
BASELINE CHARACTERISTICS IN THE SAMPLE OF HAITIAN VERSUS NON-HAITIAN STROKE PATIENTS

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Ethnicity</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Haitian (n=52)</td>
<td>Non-Haitian (n=111)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age, years-Mean (SD)</td>
<td>66.7 (12.5)</td>
<td>70.9 (14.9)</td>
<td>.080</td>
<td></td>
</tr>
<tr>
<td>Sex: Male</td>
<td>49.0 25</td>
<td>47.8 53</td>
<td>.880</td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td>&lt;.001b</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>13.7 7</td>
<td>86.4 95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black or AA</td>
<td>86.3 44</td>
<td>10.0 11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>.0 0</td>
<td>3.6 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insurance</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medicare</td>
<td>46.2 24</td>
<td>70.3 78</td>
<td>.003</td>
<td></td>
</tr>
<tr>
<td>Medicaid</td>
<td>28.9 15</td>
<td>11.7 13</td>
<td>.007</td>
<td></td>
</tr>
<tr>
<td>Other Insurance</td>
<td>17.3 9</td>
<td>17.1 19</td>
<td>.976</td>
<td></td>
</tr>
<tr>
<td>No insurance</td>
<td>23.1 19</td>
<td>9.0 10</td>
<td>.014</td>
<td></td>
</tr>
<tr>
<td>Obesity</td>
<td>25.0 13</td>
<td>19.8 22</td>
<td>.453</td>
<td></td>
</tr>
<tr>
<td>Hypertension</td>
<td>86.5 45</td>
<td>82.0 91</td>
<td>.466</td>
<td></td>
</tr>
<tr>
<td>Diabetes</td>
<td>34.6 18</td>
<td>29.7 33</td>
<td>.531</td>
<td></td>
</tr>
<tr>
<td>Dyslipidemia</td>
<td>42.3 22</td>
<td>41.4 46</td>
<td>.917</td>
<td></td>
</tr>
<tr>
<td>Smoking</td>
<td>7.7 4</td>
<td>14.4 16</td>
<td>.223</td>
<td></td>
</tr>
<tr>
<td>Afib/Flutter</td>
<td>5.8 3</td>
<td>13.5 15</td>
<td>.141</td>
<td></td>
</tr>
<tr>
<td>CAD/Prior MI</td>
<td>26.9 14</td>
<td>30.6 34</td>
<td>.628</td>
<td></td>
</tr>
<tr>
<td>Heart Failure</td>
<td>9.6 5</td>
<td>5.4 6</td>
<td>.318</td>
<td></td>
</tr>
<tr>
<td>Previous Stroke</td>
<td>28.9 16</td>
<td>18.0 20</td>
<td>.117</td>
<td></td>
</tr>
</tbody>
</table>

Note:

aValues are counts and percentages unless indicated.
bFisher’s Exact test.

of hypertrophy, thus we were unable to make conclusions regarding the type of hypertrophy. Instead, we focused on whether hypertrophy was present or not. Although not statistically significant, we found an increased rate of left ventricular hypertrophy among Haitians compared with non-Haitians. We suspect that if we had a larger sample size, the result would reach statistical significance and therefore would expand the findings of Di Tullio et al. and Kizer et al. to the Haitian population.

Ejection fraction. Afzal et al. studied racial differences in heart failure and reported that African Americans had a higher rate of reduced ejection fraction compared with Whites.11 Furthermore, Greenberg et al. found that patients with reduced ejection fraction had a 1.6-fold higher risk of ischemic stroke.12 Our study supports these findings.
<table>
<thead>
<tr>
<th></th>
<th>Haitian</th>
<th>Non-Haitian</th>
<th>Rate Difference (95% CI)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left ventricular hypertrophy(^a)</td>
<td>78% (36/46)</td>
<td>63% (64/102)</td>
<td>15.5 (.3, 30.7)</td>
<td>.062</td>
</tr>
<tr>
<td>Decreased ejection fraction(^b)</td>
<td>21% (11/52)</td>
<td>13% (14/109)</td>
<td>8.3 (–4.4, 21.1)</td>
<td>.173</td>
</tr>
<tr>
<td>Abnormal right ventricular internal dimension at diastole(^c)</td>
<td>13% (6/48)</td>
<td>13% (13/103)</td>
<td>–.1 (–11.5, 11.2)</td>
<td>.983</td>
</tr>
<tr>
<td>Abnormal left ventricular internal dimension at diastole(^c)</td>
<td>14% (7/50)</td>
<td>13% (13/99)</td>
<td>.9 (–10.8, 12.7)</td>
<td>.883</td>
</tr>
<tr>
<td>Left atrial enlargement(^d)</td>
<td>15% (8/52)</td>
<td>36% (40/111)</td>
<td>–20.7 (–33.9, –7.4)</td>
<td>.007</td>
</tr>
</tbody>
</table>

Note:
\(^a\)Left ventricular hypertrophy was reported in the text by the interpreting cardiologist
\(^b\)Decreased ejection fraction was defined as <50%
\(^c\)Abnormal right ventricular internal dimension at diastole was defined as <0.9 cm or >2.6 cm. Abnormal left ventricular internal dimension at diastole was defined as <3.5 cm or >5.7 cm.
\(^d\)Left atrial enlargement was defined as >4.0 cm
Haitians had an increased prevalence of low ejection fraction when compared with non-Haitians. While the difference was not statistically significant, it is clinically relevant.

**Left atrial enlargement.** Nagarajarao et al.\textsuperscript{13} studied echocardiograms in African Americans and found that left atrial enlargement was not a statistically significant contributor to stroke in that population. We added to the findings by Nagarajarao et al., by including non-African American patients into the study population. In doing so, we found that Haitian stroke patients had a 68% decrease in odds of left atrial enlargement compared with non-Haitians, and this finding remained statistically significant after adjusting for age, Medicaid status, and atrial fibrillation/flutter. Therefore, it appears that left atrial enlargement is not a primary contributor of stroke in the Haitian population either, as the odds of having left atrial enlargement is so much lower than in the control population.

**Strengths and limitations.** To our knowledge, this is the first study to address the potential effect of Haitian ethnicity on echocardiographic characteristics in stroke patients.

Our study was limited by its sample size. This was due to a relatively small number of Haitian patients presenting to Baptist Hospital. The sample size was further reduced because some patients did not have echocardiogram reports. In addition, there was variability in style and content of the reports. We consolidated the data by converting continuous numerical variables into categorical variables in order to conduct more meaningful analyses. A larger sample size could have narrowed our intervals and allowed us to make better conclusions about the differences in echocardiograms between Haitians and non-Haitian stroke patients.

**Implications.** Future echocardiographic studies in this population should attempt to include larger data sets and focus on left ventricular hypertrophy and ejection fraction.

**References**


