Access to Care, Acculturation, and Risk Factors for Stroke in Mexican Americans

The Brain Attack Surveillance in Corpus Christi (BASIC) Project

Melinda A. Smith, MPH; Jan M.H. Risser, PhD; Lynda D. Lisabeth, PhD; Lemuel A. Moyé, MD, PhD; Lewis B. Morgenstern, MD

Background and Purpose—Mexican Americans are the largest subgroup of Hispanic Americans, now the most numerous US minority population. We compared access to care, acculturation, and biological risk factors among Mexican American and non-Hispanic white stroke patients and the general population.

Methods—The Brain Attack Surveillance in Corpus Christi project is a population-based stroke surveillance study conducted in southeast Texas. All stroke cases were ascertained through active and passive surveillance from January 2000 through April 2002 and compared with population estimates from a random-digit telephone survey.

Results—Compared with non-Hispanic white stroke patients (n=405), Mexican American stroke patients (n=403) were less likely to have graduated from high school (odds ratio [OR], 15.4; 95% confidence interval [CI], 10.6 to 22.4) and more likely to earn less than $20 000 per year (OR, 6.5; 95% CI, 4.5 to 9.4). Mexican American stroke patients were more likely to have diabetes (OR, 2.7; 95% CI, 2.0 to 3.7) and less likely to have atrial fibrillation (OR, 0.5; 95% CI, 0.4 to 0.8). Compared with population estimates (n=719), stroke was associated with diabetes (Mexican Americans: OR, 3.6; 95% CI, 2.2 to 5.8; non-Hispanic whites: OR, 3.0; 95% CI, 1.7 to 5.5), hypertension (Mexican Americans: OR, 2.8; 95% CI, 1.8 to 4.3; non-Hispanic whites: OR, 3.3; 95% CI, 2.2 to 5.0), lower incomes (Mexican Americans: OR, 3.4; 95% CI, 2.1 to 5.4; non-Hispanic whites: OR, 3.0; 95% CI, 1.7 to 5.2), and lower educational attainment (Mexican Americans: OR, 5.1; 95% CI, 3.2 to 8.1; non-Hispanic whites: OR, 4.5; 95% CI, 2.2 to 9.3).

Conclusions—Biological and social variables are associated with stroke to a similar extent in both Mexican Americans and non-Hispanic whites. Health behavior interventions for both populations may follow from this work. Stroke disparities between these populations may be explained only partially by differences in the prevalence of currently identified biological and social factors. (Stroke. 2003;34:2671-2675.)

Key Words: epidemiology ■ Hispanic Americans ■ health services accessibility ■ stroke

Hispanic Americans are now the largest minority population in the United States, and Mexican Americans (MAs) are the overwhelmingly most numerous subgroup of this population.1 Preliminary research results on MAs have demonstrated higher stroke attack rates and higher mortality, especially at younger ages, in MAs compared with non-Hispanic whites (NHWs).2-3 As the MA population ages, the stroke burden will be felt with increasing intensity. Studies have shown that for ethnic populations such as the MA population, there are 2 obstacles to overcome before receiving quality health care: access to care and acculturation.4,5 The role of these factors in the occurrence, prevention, and treatment of stroke is poorly understood.

Access to care comprises several characteristics that describe the fit between the patient and the healthcare system. These characteristics can act as barriers or facilitators to obtaining care and can be grouped into 5 categories: affordability, availability, accessibility, accommodation, and acceptability.6,7 Acculturation is the process in which immigrant populations assimilate into their new environment. Studies have demonstrated that language barriers and the inability to comprehend the provider’s treatment plans can lead to poor compliance and underuse of services.8 Acculturative stress can also contribute to bad health and poor prognosis after disease.8

To plan effective public health interventions in high-risk populations, a better understanding and identification of important traditional and nontraditional cerebrovascular risk factors are critical. In this study, we compare stroke risk factors and access to care among MA and NHW stroke patients.
subjects in a population-based study in Nueces County, Texas. In addition, we compare these findings with stroke risk factors and access to care in the general population of this community.

**Methods**

The methods of the Brain Attack Surveillance in Corpus Christi (BASIC) were previously reported. Briefly, BASIC is a population-based stroke surveillance study in Nueces County. Nueces County is >150 miles from Houston and San Antonio, allowing complete case capture for first medical contact. The population is ~313,645, and 95% reside within Corpus Christi. NHWs make up 58% and Hispanic Americans make up 36% of the population. Our work has demonstrated that virtually all the Hispanic stroke patients identify their ancestral country of origin to be Mexico. The MA population of Nueces County is not an immigrant population but rather second- and third-generation US citizens.

**Interview Methodology for the BASIC Project**

Acute cerebrovascular events (completed ischemic strokes, transient ischemic attacks, spontaneous intracerebral and subarachnoid hemorrhage) are sought among patients ≥45 years of age admitted to all 6 area hospitals and out-of-hospital sources. Active and passive surveillance is used to identify emergency room and admitted patients. A rigorous sampling procedure is used to ascertain stroke cases that did not require hospitalization. Out-of-hospital stroke deaths are found from emergency department screening, reports from the county coroner, and the Texas Department of Health Death Database. All cerebrovascular events in patients identified between January 1, 2000, and April 30, 2002, were included in this study. Using source documents, neurologists who were blinded to subjects’ ethnicity validated cerebrovascular events on the basis of published criteria.

The patient interview contained demographic items, questions about access to care and acculturation, and an inventory of personal stroke risk factors. It was made clear that information was sought regarding the patients’ status before the index cerebrovascular event. Race-ethnicity was obtained by self-report. Every attempt was made to interview the subject as quickly as possible after stroke. Before each interview, a series of orientation questions were asked to ensure accuracy of responses. Patients unable to answer appropriately and those who had died had a proxy interview. Proxy interviews were done with the person who best knew the patient’s daily activities and medical history. A substudy was conducted to determine the agreement rates among 20 patient/proxy subjects.

Patients were asked if a physician had ever told them that they had any of the conventional risk factors. As another substudy, self-report and medical record risk factor data were compared. Access to care information was collected. To measure acculturation, subjects were asked a series of questions regarding birth, country considered home, and preferred language. A series of Likert Scale questions were developed based on previous work in the Mexican American population. The questions were used to assess the patient’s trust and confidence in the US healthcare system. They were pilot tested in the Corpus Christi community.

**Population Estimates of Access to Care, Acculturation, and Stroke Risk Factors**

Population estimates were determined by the use of data from an academic, professional random-digit telephone study of 719 individuals in the same community conducted from July through September 1999. The results of this study were published previously. The survey contained demographic items, questions about access to care and acculturation, and an inventory of personal stroke risk factors. Race-ethnicity was obtained by self-report. Surveys were administered in Spanish or English by the same interviewer who read a script for standardization. Only those subjects ≥45 years of age with no history of stroke were used for comparison with the BASIC stroke patients (n=339).

**Statistical Analysis**

For the stroke interview data, ethnic differences in interview responses were determined. Two-tailed t tests were used to determine the variation in the distributions of categorical variables. The Mantel-Haenszel $\chi^2$ statistic was used to test for variation in the distributions of categorical variables. Logistic regression was used to assess the relationships between ethnicity and the various outcome measures, adjusting for age and sex. For comparison of the stroke patient interview results and population estimates, the analysis was performed as a stratified case-control analysis with a formal test of interaction by ethnicity. Logistic regression was used to adjust for age and sex.

These projects were approved by the University of Michigan and the University of Texas at Houston Institutional Review boards, the Corpus Christi/Nueces County Public Health District, and all participating hospitals.

**Results**

Between January 1, 2000, and April 30, 2002, a total of 2290 potential stroke patients were identified. Of these, 1308 were validated as stroke by study neurologists. Of these, 959 (481 MAs, 478 NHWs) were randomly chosen to be interviewed. The interview cooperation rate was 84%, with 808 agreeing to participate (403 MAs, 405 NHWs). Ethnicity was not associated with interview completion ($\chi^2=0.44, P=0.80$). Most interview data were collected directly from the stroke patient (67%; 543 of 808). Proxy interviews were completed for 143 MAs (35%) and 122 NHWs (30%). There was no association of proxy interview use and ethnicity ($\chi^2=2.63, P=0.11$). For the proxy substudy, the agreement rate between patient/proxy interviews for 6 critical elements ranged from 84% to 100%.

**Demographics**

The age, ethnic, and sex composition of the interview sample is shown in Table 1. Women represented 57% of the entire sample, 58% of MA subjects, and 56% of NHW subjects. There was no difference in distribution of sex between the ethnic groups ($\chi^2=0.26, P=0.61$). The MA subjects were significantly younger than the NHW subjects (70 versus 75 years of age, $P<0.001$).

**Stroke Type**

Among NHW, 8% of strokes were hemorrhagic compared with 14% of strokes among MA (odds ratio [OR], 0.58; 95% confidence interval [CI], 0.37 to 0.92). The distribution of risk factors and access to care variables did not vary significantly when examined by stroke type. Data are presented for all stroke types combined.
TABLE 2. Proportions and ORs of Factors Reported by MA and NHW Stroke Cases With NHWs as the Referent Group: BASIC Project, January 2000 Through April 2002

<table>
<thead>
<tr>
<th>Variable</th>
<th>MA (n=403), %</th>
<th>NHW (n=405), %</th>
<th>Univariate OR (95% CI)*</th>
<th>Adjusted OR (95% CI †)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk factors</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypertension</td>
<td>71</td>
<td>66</td>
<td>1.31 (0.97–1.76)</td>
<td>1.19 (0.87–1.62)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>48</td>
<td>23</td>
<td>2.99 (2.21–4.06)</td>
<td>2.69 (1.97–3.69)</td>
</tr>
<tr>
<td>Atrial fibrillation</td>
<td>10</td>
<td>20</td>
<td>0.47 (0.31–0.71)</td>
<td>0.53 (0.35–0.82)</td>
</tr>
<tr>
<td>High cholesterol</td>
<td>40</td>
<td>44</td>
<td>0.84 (0.63–1.13)</td>
<td>0.76 (0.56–1.02)</td>
</tr>
<tr>
<td>Heart disease</td>
<td>31</td>
<td>31</td>
<td>0.97 (0.72–1.30)</td>
<td>1.06 (0.78–1.44)</td>
</tr>
<tr>
<td>Current smoker</td>
<td>16</td>
<td>15</td>
<td>1.10 (0.76–1.61)</td>
<td>0.83 (0.56–1.25)</td>
</tr>
<tr>
<td>Excessive alcohol use</td>
<td>4</td>
<td>3</td>
<td>1.62 (0.73–3.61)</td>
<td>1.38 (0.60–2.19)</td>
</tr>
<tr>
<td>Access to care</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No insurance</td>
<td>9</td>
<td>3</td>
<td>2.89 (1.54–5.41)</td>
<td>1.67 (0.84–3.32)</td>
</tr>
<tr>
<td>Routine physician</td>
<td>88</td>
<td>93</td>
<td>0.57 (0.35–0.93)</td>
<td>0.76 (0.45–1.26)</td>
</tr>
<tr>
<td>Routine place</td>
<td>88</td>
<td>92</td>
<td>0.65 (0.40–1.02)</td>
<td>0.69 (0.43–1.12)</td>
</tr>
<tr>
<td>Income $20 000/y</td>
<td>81</td>
<td>45</td>
<td>5.13 (3.64–7.23)</td>
<td>6.47 (4.45–9.42)</td>
</tr>
<tr>
<td>Not high school graduate</td>
<td>77</td>
<td>22</td>
<td>11.31 (8.12–15.75)</td>
<td>15.41 (10.61–22.42)</td>
</tr>
<tr>
<td>Employed (&lt;65 y)</td>
<td>46</td>
<td>52</td>
<td>0.79 (0.45–1.40)</td>
<td>0.65 (0.35–1.20)</td>
</tr>
<tr>
<td>Seen physician within 1 y</td>
<td>96</td>
<td>96</td>
<td>0.81 (0.39–1.67)</td>
<td>1.03 (0.49–2.19)</td>
</tr>
</tbody>
</table>

ORs >1 indicate greater prevalence of that risk factor among MA stroke cases.

*Univariate logistic regression; †logistic regression: All included factors are listed; each was adjusted for age and sex.

Risk Factor Characteristics

Table 2 gives self-reported risk factor characteristics by ethnicity for stroke cases. After adjustment for age and sex, MA and NHW stroke patients were equally likely to have been told by a physician that they have hypertension, heart disease, or high cholesterol. However, MAs were ~3 times more likely to have diabetes, and NHWs were ~2 times more likely to have atrial fibrillation. For stroke risk factor behaviors, there were no ethnic differences in the proportions of patients reporting current tobacco use or excessive alcohol consumption (>21 drinks per week). The percent agreement between self-report and medical record risk factor data was high for atrial fibrillation (82.1%; κ=0.54; 95% CI, 0.45 to 0.63), diabetes (91.6%; κ=0.86; 95% CI, 0.82 to 0.90), coronary artery disease (82.3%; κ=0.63; 95% CI, 0.58 to 0.69), and hypertension (82.9%; κ=0.62; 95% CI, 0.57 to 0.68). High cholesterol had moderate agreement (67.1%; κ=0.37; 95% CI, 0.33 to 0.45). Among patients with hypertension, high cholesterol, atrial fibrillation, heart disease, and/or diabetes, there were no significant ethnic differences in the proportions consuming medications to treat these conditions.

Access to Care Characteristics

Table 2 also reports the ethnic-specific access to care results. Although MAs appeared less likely to have health insurance and a primary care physician in the univariate analysis, after adjustment for age and sex, these associations were lost. MAs were as likely as NHWs to have a routine place for health care, to have visited a physician in the 12 months before stroke, and to be employed. MAs were 15 times more likely to not have graduated from high school and ~7 times more likely to have a family income less than $20 000 per year.

Acculturation

We found that 87% of MAs and 93% of NHWs were born in the United States. Mexico was the origin of all MA subjects not born in the United States. On average, these individuals had been living in the United States for 60 years (range, 19 to 86 years). When asked what country they identify as home, only 1% of MAs did not identify the United States. Among MAs, 54% prefer to speak Spanish only, and 33% reported little to no communication in English. For the 3 Likert Scale questions, no significant differences were found by ethnicity. In answer to the questions, “Do you believe that the United States health care system provides you with excellent health care?” and “If you were sick and went to the hospital, would you have complete trust in the doctors and nurses that would take care of you?” both groups expressed confidence and trust in the healthcare system (t test = 0.087, P = 0.96; t test = 0.405, P = 0.68, respectively). When asked, “Do you believe that depending on their race, gender or primary language some people in the United States get better health care than others?” the responses varied greatly, but the frequency of responses by ethnicity was similar (t test = -1.33, P = 0.183). However, it should be noted that slightly more than one third of both ethnicities thought there is some discrimination in healthcare delivery based on Likert scores of 8 to 10.

Comparison of BASIC Interview Results and Population Estimates

Demographics

MA and NHW stroke patients were significantly older than the MA and NHW population estimates obtained by the
random-digit telephone survey (MA, 70 versus 58 years; NHW, 75 versus 60 years). MA stroke patients and MAs from
the phone survey were equally likely to be born in the United
States. Of those not born in the United States, almost all were
born in Mexico. Although we found that 25% of the MA
stroke patients reported little to no proficiency in the English
language, this lack of proficiency was found in only 9% of the
nonstroke population.

**Access to Care and Risk Factors**

In comparisons of stroke patients and population estimates,
the ethnic-specific OR comparisons were similar even though
the actual prevalence values differed (see Table 3). Low
income, no high school education, visit to a doctor in the last
year, hypertension, and diabetes all were associated with
stroke in both ethnic groups. Although a greater proportion of
MAs have an income less than $20,000, the ORs for both
ethnicities were similar (NHW: OR, 3.0; 95% CI, 1.7 to 5.2;
MA: OR, 3.4; 95% CI, 2.1 to 5.4). The same relationship can
be found for not completing high school (NHW: OR, 4.5;
95% CI, 2.2 to 9.3; MA: OR, 5.1; 95% CI, 3.2 to 8.1).

**Discussion**

This study found that both conventional stroke risk factors
and access to care/acculturation variables are associated with
stroke in MAs and NHWs. Health disparities likely exist with
respect to stroke in MAs and NHWs, and the present study shows that there are relatively small differences among
these groups with respect to the differential impact of
currently known biological or social factors. Results of this
study suggest that risk factor reduction and attention to access
to care variables are likely to reduce the burden of stroke in
both ethnic populations.

There were similar ethnic results in the association of
socioeconomic status (SES) and stroke (Table 3). In this
study, SES measures (education and income) were considered
measures of access to care. SES was included in access to
care analyses because low SES has been shown to be
associated with less access to care and less healthcare usage,
even among those with health insurance. Indeed, among both
ethnicities, there was no disparity in health insurance
and/or a primary care physician or routine place for care.
However, race-ethnic SES disparities did exist among MA
compared with NHW stroke subjects (Table 2). Although MA
stroke patients are more likely to have low SES compared
with MA population estimates, low SES was also found to be
associated with stroke in the NHW population (Table 3). Low
SES and race-ethnicity have been associated with the quality
of medical care received by patients. Receiving good-
quality and meaningful health care is important to better
health status and reduced morbidity.

Among Mexican Americans, factors of acculturation such
as language barriers are associated with access to care.
Studies have found that language barriers interfere with the
quality of care received. We found even among Spanish-


<table>
<thead>
<tr>
<th></th>
<th>MA*</th>
<th>NHW*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pop</td>
<td>Cases</td>
</tr>
<tr>
<td>Insurance</td>
<td>84.3</td>
<td>90.6</td>
</tr>
<tr>
<td>Routine physician</td>
<td>83.7</td>
<td>88.0</td>
</tr>
<tr>
<td>Income &lt;$20,000/y</td>
<td>42.3</td>
<td>80.5</td>
</tr>
<tr>
<td>Not high school graduate</td>
<td>27.0</td>
<td>76.5</td>
</tr>
<tr>
<td>Doctor visit within 1 y</td>
<td>86.4</td>
<td>95.7</td>
</tr>
<tr>
<td>Hypertension</td>
<td>46.6</td>
<td>71.5</td>
</tr>
<tr>
<td>Diabetes</td>
<td>21.8</td>
<td>47.7</td>
</tr>
<tr>
<td>High cholesterol</td>
<td>40.0</td>
<td>40.0</td>
</tr>
<tr>
<td>Smoker</td>
<td>23.0</td>
<td>16.4</td>
</tr>
</tbody>
</table>

ORs >1 indicate greater prevalence of that risk factor among cases compared with population (Pop).
*No race-ethnicity interaction was found to be significant.
†Logistic regression. All included factors are listed; each was adjusted for age and sex.
associations exist that we were not able to detect with our sample size.

Other limitations are potential information bias such as missing data and the reliance on risk factor prevalence data from patient reports. This self-report information was corroborated by medical records. Furthermore, the positive results found in the Likert scale questions may be due to this community’s high rate of bilingual providers and the fact that this is not an immigrant community. Generalizing these results to other populations of Mexican Americans should be done with these considerations in mind. A further limitation is the lack of data on other factors that may be important to stroke risk such as stress, neighborhood factors, depression, and fatalism. Interactions of variables such as low education with these variables suggest that our analysis may have been oversimplified. The analysis was limited to patients who sought medical care in an outpatient or inpatient setting. Lastly, this study demonstrates associations of social and biological risk factors with stroke. The study design does not allow causal inference.

Interventions to decrease the burden of stroke in the diverse US population are likely to be well received at this time on the basis of the current level of trust among the population in the healthcare system. The data suggest that successful attempts to remove ethnic stroke disparities should target MAs and focus on existing social and biological risk factors. However, disparities in susceptibility to stroke between MAs and NHWs are explained only partially by the currently identified social and biological variables, and further research is warranted.

Acknowledgments
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References
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