Ethnic Differences in Poststroke Quality of Life in the Brain Attack Surveillance in Corpus Christi (BASIC) Project

Sarah L. Reeves, PhD; Devin L. Brown, MD; Jonggyu Baek, PhD; Jeffrey J. Wing, PhD; Lewis B. Morgenstern, MD; Lynda D. Lisabeth, PhD

Background and Purpose—Mexican Americans (MAs) have an increased risk of stroke and experience worse poststroke disability than non-Hispanic whites, which may translate into worse poststroke quality of life (QOL). We assessed ethnic differences in poststroke QOL, as well as potential modification of associations by age, sex, and initial stroke severity.

Methods—Ischemic stroke survivors were identified through the biethnic, population-based Brain Attack Surveillance in Corpus Christi (BASIC) Project. Data were collected from medical records, baseline interviews, and 90-day poststroke interviews. Poststroke QOL was measured at ≈90 days by the validated short-form stroke-specific QOL in 3 domains: overall, physical, and psychosocial (range, 0–5; higher scores represent better QOL). Tobit regression was used to model associations between ethnicity and poststroke QOL scores, adjusted for demographics, clinical characteristics, and prestroke cognition and function.

Results—Among 290 eligible stroke survivors (66% MA, 34% non-Hispanic whites, median age=69 years), median scores for overall, physical, and psychosocial poststroke QOL were 3.3, 3.8, and 2.7, respectively. Poststroke QOL was lower for MAs than non-Hispanic whites both overall (mean difference, −0.30; 95% confidence interval, −0.59, −0.01) and in the physical domain (mean difference, −0.47; 95% confidence interval, −0.81, −0.14) after multivariable adjustment. No ethnic difference was found in the psychosocial domain. Age modified the associations between ethnicity and poststroke QOL such that differences were present in older but not in younger ages.

Conclusions—Disparities exist in poststroke QOL for MAs and seem to be driven by differences in older stroke patients. Targeted interventions to improve outcomes among MA stroke survivors are urgently needed. (Stroke. 2015;46:2896-2901. DOI: 10.1161/STROKEAHA.115.010328.)

Key Words: ethnicity ■ Mexican American ■ outcomes research ■ quality of life ■ stroke

Quality of life (QOL) is a multidimensional construct incorporating individual perception of life circumstances, and its importance has been underscored by both the World Health Organization and Healthy People 2020.1,2 Mexican Americans (MAs) have an increased risk of stroke compared with non-Hispanic whites (NHWs) and experience worse poststroke disability even after accounting for demographics, prestroke factors, and stroke severity.3 This may lead to poorer poststroke QOL among MAs; however, the impact of disability on poststroke QOL among MAs may be attenuated by factors more likely to be experienced by MAs, such as higher levels of social support and younger ages at stroke onset, which are associated with better QOL.3-7 Racial disparities exist in poststroke QOL, with nonwhite stroke survivors reporting poorer physical QOL when compared with whites, and blacks experiencing a greater increase in depressive symptoms after stroke than whites, but little is known about ethnic disparities in poststroke QOL.4,8,9 Therefore, we assessed ethnic differences in poststroke QOL among MAs and NHWs in a biethnic population-based stroke study. As ethnic differences in QOL may be more pronounced in subgroups that experience worse long-term outcomes, such as women, older survivors, and those with less severe stroke,4,8,10-12 we also explored whether these factors modified the associations between ethnicity and poststroke QOL.

Methods

Stroke Ascertainment

Ischemic stroke survivors were identified through the ongoing Brain Attack Surveillance in Corpus Christi (BASIC) Project, a population-based stroke surveillance study in Nueces County, TX. The methods of the BASIC project have been previously described.13 Briefly, stroke cases among patients aged >45 years are obtained through active and passive surveillance. If a patient is identified as a potential stroke case, medical records are systematically reviewed by stroke fellowship trained study physicians blinded to ethnicity and age to validate strokes. Validated ischemic strokes were included using a...
standard clinical definition; events were limited to an individual’s first event during the study time period.14

Individual-Level Patient Factors
All stroke cases were invited to participate in an in-person baseline interview; a proxy is sought in the event that the case cannot answer a series of orientation questions.15 Approximately 47% of these interviews are conducted in hospital; the remaining interviews occur in the survivor’s home or via telephone (small percentages).10 The primary exposure for this study was self-reported ethnicity, which was obtained from the baseline interview. Age, sex, educational attainment, marital status, smoking history, and prestroke functional and cognitive status were also obtained from the baseline interview. Prestroke function was measured within the interview by the modified Rankin Scale (mRS). Prestroke cognitive status was measured using the 16-item Informant Questionnaire on Cognitive Decline in the Elderly (IQCODE) and completed in-person or over the telephone by an individual who knew the patient well.16 Data collected from the medical record for all patients included the following risk factors and comorbidities: history of stroke/transient ischemic attack, hypertension, diabetes mellitus, coronary artery disease or myocardial infarction, atrial fibrillation, high cholesterol, smoking status, excessive alcohol use, cancer, chronic obstructive pulmonary disease, congestive heart failure, Parkinson’s disease, end stage renal disease, Alzheimer’s disease or dementia, and epilepsy. Using these variables, a comorbidity index was created, which summed the individual risk factors and comorbidities listed above and ranged from 0 to 15; this comorbidity index has been previously used within this study population.10,11 Medical record data were collected regarding body mass index, receipt of tissue-type plasminogen activator, insurance status, and prior residence in a nursing home. Initial National Institutes of Health Stroke Scale (NIHSS) score was either abstracted from the medical record or calculated from the medical record using a validated method.17

Cases who participate in the baseline interview are asked to complete an in-person outcome interview at ≈90 days. Whenever possible, these interviews are conducted in-person; however, a small subset is performed over the phone when necessary. In cases where the survivor is unable to complete the interview, a proxy is used. Since May 2010, cases have been asked to answer the 12-item short-form stroke-specific quality of life scale (SSQOL). The short-form SSQOL is a standardized tool to measure health-related QOL that has been validated in patients with different types of stroke, as well as within the BASIC study population.19–21 Three summary scores, which served as the primary outcomes, were calculated for each stroke case as the average score within each domain: (1) overall, (2) physical, and (3) psychosocial domains. Scores ranged from 0 to 5; higher scores represent better QOL. In addition, neurological deficits were measured by the NIHSS administered by a certified study coordinator at the time of the 90-day outcome interview.

Statistical Analysis
Ischemic stroke cases with complete data were included in the analysis. Medians/interquartile ranges (IQR) or frequencies/percentages were calculated for all demographics and risk factors by ethnicity and compared using χ2 and Kruskal–Wallis tests. Tobit regression was used to model unadjusted associations between ethnicity (MA versus NHW) and the 3 poststroke QOL summary scores. Tobit regression was used to minimize bias because of the QOL scores being restrained by lower and upper bounds.22 Models were then adjusted for the following prespecified demographic and clinical factors: age, sex, education, insurance status, marital status, residing in a nursing home before stroke, prestroke mRS, prestroke IQCODE, body mass index, initial NIHSS, comorbidity index, stroke/transient ischemic attack history, receipt of tissue-type plasminogen activator, smoking status, presence of hypertension, diabetes mellitus, atrial fibrillation, and coronary artery disease/myocardial infarction. Functional forms of continuous covariates were investigated by testing the significance of higher order polynomial terms; age, IQCODE, comorbidity index, and body mass index were modeled linearly, initial NIHSS as a quadratic term.

To obtain an adjusted Cohen’s standardized effect size, the between ethnic group QOL differences were divided by the overall SD of the QOL measure of interest.23 Separate models were run with interaction terms for ethnicity and age, sex, and initial NIHSS to assess effect modification by these factors. If effect modification was present (P value <0.10), stratified estimates of the associations were provided.

A post hoc analysis further explored potential explanations for the observed ethnic differences in poststroke QOL. First, an age-adjusted ethnic difference of individual questions in the SSQOL was estimated using linear regression models. Second, as neurological outcome is measuring a different construct from QOL, 90-day poststroke NIHSS was added to the fully adjusted models to determine whether poor outcome explained ethnic differences in QOL. Given that effect modification of the ethnic association by age, poststroke NIHSS was considered in the final model both as a main effect (modeled quadratically) and as interaction terms with age; estimates of the ethnic associations at the 25th, 50th, and 75th percentile of age were evaluated to determine the influence of adjustment for NIHSS.

<table>
<thead>
<tr>
<th>Table 1. Baseline Characteristics by Ethnicity, Brain Attack Surveillance in Corpus Christi Project, May 2010 to June 2012 (n=290)</th>
<th>NHW, n=99</th>
<th>MA, n=191</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, y</td>
<td>72 (61–82)</td>
<td>66 (58–77)</td>
<td>0.02</td>
</tr>
<tr>
<td>Female</td>
<td>51 (51)</td>
<td>104 (54)</td>
<td>0.63</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married/living together</td>
<td>52 (52)</td>
<td>103 (54)</td>
<td>0.82</td>
</tr>
<tr>
<td>Single</td>
<td>4 (4)</td>
<td>7 (4)</td>
<td>0.87</td>
</tr>
<tr>
<td>Widowed</td>
<td>19 (19)</td>
<td>51 (27)</td>
<td>0.16</td>
</tr>
<tr>
<td>Divorced/separated</td>
<td>24 (24)</td>
<td>30 (16)</td>
<td>0.08</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than high school</td>
<td>11 (11)</td>
<td>99 (52)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>High school</td>
<td>31 (31)</td>
<td>49 (26)</td>
<td>...</td>
</tr>
<tr>
<td>Vocational/some college</td>
<td>29 (29)</td>
<td>28 (15)</td>
<td>...</td>
</tr>
<tr>
<td>College or more</td>
<td>28 (28)</td>
<td>15 (8)</td>
<td>...</td>
</tr>
<tr>
<td>Insured</td>
<td>92 (93)</td>
<td>171 (90)</td>
<td>0.34</td>
</tr>
<tr>
<td>Residence in nursing home</td>
<td>1 (1)</td>
<td>3 (2)</td>
<td>0.7</td>
</tr>
<tr>
<td>mRS score</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0–1</td>
<td>48 (48)</td>
<td>85 (45)</td>
<td>0.77</td>
</tr>
<tr>
<td>2–3</td>
<td>43 (43)</td>
<td>87 (46)</td>
<td>...</td>
</tr>
<tr>
<td>4+</td>
<td>8 (8)</td>
<td>19 (10)</td>
<td>...</td>
</tr>
<tr>
<td>Treated with tPA</td>
<td>16 (16)</td>
<td>17 (9)</td>
<td>0.06</td>
</tr>
<tr>
<td>Atrial fibrillation</td>
<td>20 (20)</td>
<td>13 (7)</td>
<td>0.0007</td>
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<tr>
<td>Coronary artery disease</td>
<td>32 (32)</td>
<td>57 (30)</td>
<td>0.66</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>26 (26)</td>
<td>110 (58)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Hypertension</td>
<td>76 (77)</td>
<td>165 (86)</td>
<td>0.04</td>
</tr>
<tr>
<td>History of stroke or TIA</td>
<td>27 (27)</td>
<td>62 (32)</td>
<td>0.36</td>
</tr>
<tr>
<td>Current/former smoker</td>
<td>48 (48)</td>
<td>48 (25)</td>
<td>0.0003</td>
</tr>
<tr>
<td>Initial NIHSS</td>
<td>4 (2–9)</td>
<td>4 (2–8)</td>
<td>0.11</td>
</tr>
<tr>
<td>IQCODE</td>
<td>50 (48–56)</td>
<td>49 (48–54)</td>
<td>0.12</td>
</tr>
<tr>
<td>Comorbidity index</td>
<td>4 (2–5)</td>
<td>3 (2–4)</td>
<td>0.05</td>
</tr>
<tr>
<td>BMI</td>
<td>26 (24–32)</td>
<td>29 (26–34)</td>
<td>0.0007</td>
</tr>
</tbody>
</table>

BMI indicates body mass index; IQCODE, Informant Questionnaire for Cognitive Decline in the Elderly; MA, Mexican American; mRS, modified Rankin Scale; NIHSS, National Institutes of Health Stroke Scale; NHW, non-Hispanic white; TIA, transient ischemic attack; and tPA, tissue-type plasminogen activator.
This study was approved by the Institutional Review Boards (IRB) at the University of Michigan and the local hospitals.

Results
A total of 749 MA and NHW patients had an ischemic stroke from May 2010 to June 2012. Among these patients, 493 (70.1%) agreed to be interviewed. Although participation did not differ by stroke severity \((P=0.95)\), MAs were more likely to participate at baseline \((P=0.08)\). Fifty-eight baseline interviews were completed by a proxy respondent; this did not differ by ethnicity \((P=0.80)\).

Sixty-four participants (13%) were excluded because of mortality before completion of the 90-day outcome interview, 49 patients could not be located, and 30 patients refused the outcome interview. Among the 350 (81.6%) survivors who completed the outcome interview, participation did not differ by ethnicity \((P=0.46)\); however, those with more severe strokes were more likely to be lost to follow-up \((P=0.002)\). Sixty participants were missing data for IQCODE, body mass index, education, or SSQOL, resulting in a total of 290 eligible participants (all other variable data were complete); 191 (66%) were MA and 99 (34%) were NHW. Overall, MAs were younger and had more comorbidities than NHWs (Table 1).

QOL Overall Summary Score
The median overall poststroke QOL score was 3.0 for MAs (IQR, 1.9) and 3.4 (IQR, 1.5) for NHWs (scores range from 0 to 5; higher scores represent higher QOL). The unadjusted model indicated that MAs experienced lower overall poststroke QOL when compared with NHWs 90 days post stroke (mean difference, −0.30 comparing MAs with NHWs; 95% confidence interval [CI], −0.57, −0.03). This ethnic difference persisted after multivariable adjustment (mean difference, −0.30; 95% CI, −0.59, −0.01). This translated into a Cohen’s standardized effect size of 0.27 (considered small [0.20] to medium [0.50]).

Lower overall poststroke QOL was associated with higher prestroke mRS, IQCODE, and NIHSS (higher scores represent greater impairment), as well as a history of stroke/transient ischemic attack (Table 2).

QOL Physical Summary Score
The median physical poststroke QOL score was 3.8 (IQR, 2.2) for MAs and 4.2 (IQR, 1.7) for NHWs. Table 2.
difference in physical poststroke QOL scores when comparing MAs with NHWs (mean difference, −0.43, 95% CI, −0.77, −0.09) that persisted when adjusted for potential confounders (mean difference, −0.47; 95% CI, −0.81, −0.14). This also translated into a Cohen’s standardized effect size considered small to medium (0.36). A lower physical poststroke QOL score was associated with higher prestroke mRS and NIHSS and higher age.

**QOL Psychosocial Summary Score**

The median psychosocial poststroke QOL score was 2.7 (IQR, 2.2) for MAs and 3.0 (IQR, 2.0) for NHWs. The unadjusted association between ethnicity and psychosocial poststroke QOL indicated that MAs experienced lower psychosocial poststroke QOL when compared with NHWs (mean difference, −0.32, 95% CI, −0.66, 0.03); however, this difference was not statistically significant before or after multivariable adjustment (mean difference, −0.25, 95% CI, −0.61, 0.12). Lower psychosocial poststroke QOL score was associated with higher IQCODE and NIHSS and with a history of stroke/transient ischemic attack.

**Effect Modification**

Age modified the associations between ethnicity and the 3 poststroke QOL summary scores. No ethnic differences were present at younger ages; however, the association between ethnicity and poststroke QOL became stronger as age increased for all 3 QOL domains (Figure 1). There was some evidence that sex modified the associations between ethnicity and the QOL measures, with ethnic differences in poststroke QOL being stronger among women; however, this effect modification did not reach statistical significance (Figure 2). Initial NIHSS did not modify the relationships between ethnicity and the 3 QOL summary scores (P values >0.50 for all QOL measures).

**Post Hoc Analysis**

MAs consistently reported poorer poststroke QOL across almost all individual items in the SSQOL (Table 3). However, the majority of the significant ethnic differences were with respect to the physical QOL questions. After the addition of poststroke NIHSS to the final multivariable model, the association between ethnicity and total QOL was attenuated and borderline significant,
and ethnic differences were no longer significant at older ages (Figure I in the online-only Data Supplement).

**Discussion**

In our population of stroke survivors in Nueces County, TX, MAs experienced worse poststroke QOL compared with NHWs, both in overall and in physical QOL; these differences translated into a small to medium standardized effect size.\(^{22}\) Ethnic differences in poststroke QOL became stronger as age increased. Our findings suggest that the disparate burden of stroke in MAs extends to QOL. As we accounted for prestroke factors, these differences likely reflect disparities in poststroke outcomes. In addition, other studies have demonstrated higher QOL in MAs when compared with NHWs in the general population.\(^{23}\) Interventions focused among older stroke survivors may improve poststroke QOL and decrease disparities in the MA population.

Limited data exist on the poststroke QOL of Hispanics. One study indicated poststroke QOL differences between Hispanics of predominantly Puerto Rican and Dominican descent and NHWs only existed among those with less severe strokes.\(^{12}\) Our results are consistent in identifying ethnic differences in poststroke QOL; however, we found ethnic differences across all levels of stroke severity. This suggests that MAs may face different challenges post stroke or that the NHWs in this population have better stroke outcomes than in previous studies. However, the stroke outcomes in the BASIC NHW population are comparable with those within the Framingham population; therefore, the latter seems unlikely.\(^{10}\)

Post hoc analysis revealed that poor functional and neurological outcomes are likely driving the ethnic differences in QOL. This is consistent with recent data from the BASIC project that MAs experienced worse functional, neurological, and cognitive poststroke outcomes when compared with NHWs.\(^3\) In this community, MAs live in more socioeconomically disadvantaged neighborhoods than NHWs,\(^{24}\) which could contribute to differences in poststroke outcomes through access to rehabilitation or other health services. These differences could lead to less improvement in functional outcomes over time, although there are little available data to inform this hypothesis.\(^{25}\)

The lack of ethnic differences in psychosocial poststroke QOL despite differences in physical poststroke QOL may be reflective of cultural differences between the 2 ethnic groups, such as informal caregiving, familialism, and spirituality.\(^{26}\) Hispanics are, in general, more likely to receive informal caregiving, which may also be true for stroke survivors.\(^{26,27}\) MAs also have higher levels of perceived familial support than NHWs.\(^{9}\) In addition, MAs report more prestroke spirituality than NHWs, which may affect psychosocial aspects of the survivor’s life.\(^{28}\) These social support structures may attenuate the effect of stroke on psychosocial QOL among MAs, even despite worse cognitive, neurological, and functional outcomes.\(^3\) However, it is interesting to note that the average scores for psychosocial poststroke QOL were lower among both MAs and NHWs when compared with the overall and physical poststroke QOL scores. This suggests room for improvement exists in psychosocial poststroke QOL across both ethnic groups.

Limitations exist to this study. Loss to follow-up is a concern because the likelihood of completing the 90-day poststroke interview was associated with stroke severity; however, loss to follow-up did not differ by ethnicity. The mRS and IOWS may be subject to recall bias because they were administered in reference to the prestroke period.\(^{16}\) In addition, the comorbidity index used in this analysis has not been validated. Although we did not have information on prestroke QOL, we measured and adjusted for numerous prestroke constructs that likely reflect QOL, such as the prestroke cognition, function, and comorbidity level. If any potential factors included in our models are located on the causal pathway between ethnicity and poststroke QOL, the models may be overadjusted. Finally, this study explored ethnic differences in poststroke QOL within a single community and may not be generalizable to the United States as a whole. However, the sociodemographic characteristics of Nueces County are reflective of the changing demographics of the United States.

In conclusion, disparities exist in poststroke QOL for MAs. Targeted interventions to improve outcomes in the growing population of MA stroke survivors are urgently needed, particularly among older stroke survivors.

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Disclosures

None.

References

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