

The Association between Changes in Behavioral Risk Factors for Stroke and Changes in Blood Pressure

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Background: High blood pressure (BP) is the leading risk factor for stroke. Data on the association of physical activity (PA), fruit and vegetable (F&V) consumption, and dietary sodium with hypertension are lacking in Hispanic communities. In the current report, we provide data on the association between changes in these stroke behavioral risk factors and BP change. *Methods:* Participants were recruited from participating Catholic churches in Nueces County, Texas. BP was measured, and self-reported validated scales of F&V consumption, dietary sodium, and PA were collected at baseline and at 12 months. Linear mixed models were used to examine the associations between tertiles of improvement in the 3 behavior outcomes and BP change, adjusted for demographic characteristics. The association between the binary measure of at least 5 mmHg diastolic blood pressure (DBP) or 10 mmHg systolic blood pressure (SBP) reduction and behavior change was estimated with multilevel logistic regression models. *Results:* Of 586 participants, 66% were female and 82% were Mexican American (MA), and the mean age was 54 years. High compared with low change in PA was significantly associated with DBP change ($P = .022$), and high compared with low change in F&V intake was significantly associated with SBP change ($P = .032$). For the binary changes in DBP or SBP, there was a borderline association of PA ($P = .054$); all other variables were not associated ($P > .10$). *Conclusions:* PA and F&V consumption are potential stroke prevention targets in predominantly MA populations. **Key Words:** Hispanic—hypertension—stroke prevention—physical activity—sodium—fruit and vegetable.

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Introduction

Studies suggest that physical activity (PA) and dietary behaviors are important for blood pressure (BP) control. The Stroke Health and Risk Education (SHARE) study was a community-based behavioral intervention trial aimed at stroke prevention by targeting behavioral risk factors for hypertension. The study included predominantly Mexican Americans (MAs) and partnered with the Diocese of Corpus Christi, Texas, to deliver the intervention. The study demonstrated modest improvement in the primary outcomes of fruit and vegetable (F&V) intake and sodium reduction, but not PA, in the group randomized to receive the intervention compared to the control group. There were no changes in the secondary outcome of BP change in the intervention compared with the control group.¹

Multiethnic studies are important to address stroke disparities. MAs have increased stroke risk compared with non-Hispanic whites (NHWs),² and hypertension is the number one risk factor for stroke.³ Addressing stroke risk in MAs logically suggests the importance of BP control. Indeed, while Hispanics are under-represented in hypertension control trials, the available data suggest that BP control is worse in Hispanics compared with NHWs and African Americans.⁴

In the current article, we determine the association of changes in PA, F&V intake, and sodium reduction with BP change in the SHARE study population. There are clinical trial and observational data that suggest that increasing F&V intake⁵⁻⁷ and PA^{8,9} is associated with BP reduction. Although more controversial, there is also evidence that reducing sodium is associated with lower BP¹⁰⁻¹² with recent society calls for governments to mandate sodium restriction.¹³ The 2013 Guideline on Lifestyle Management to Reduce Cardiovascular Risk suggests increases in F&V intake, PA, and reductions in dietary sodium.¹⁴ The current study provides an opportunity to determine if changes in these 3 behavioral risk factors are indeed associated with changes in BP in a predominantly MA community. The study also affords the opportunity to view whether results suggested by guidelines are applicable to “real-world” communities without academic medical centers.

Methods

SHARE was a National Institutes of Health-funded cluster-randomized, parallel group, church-based, multicomponent behavioral intervention trial designed to reduce stroke risk in MAs and NHWs living in Corpus Christi, Texas (Clinical Trial Registration). The comparison group received skin cancer awareness materials. We adopted F&V consumption, PA, and dietary sodium as coequal primary outcomes and included systolic blood pressure (SBP) as a secondary measure and diastolic blood pressure (DBP) as an exploratory measure. The association of the primary outcome measure with changes in SBP and DBP is presented here. SHARE methods were previously reported.¹⁵ Because BP was not influenced by the intervention, we present results here combined for intervention and control groups and will not review the intervention methods.

Study Subjects

Subjects were recruited as family or friend pairs from Catholic churches in Nueces County, Texas. Subjects provided demographic information including race, ethnicity, and educational attainment. Approximately 95% of the residents of Nueces County, Texas, reside in the City of Corpus Christi, which is an urban location of approximately 350,000 people on the Southern Texas Gulf Coast.

Approximately two thirds of the population is MA and one third NHW. The MA population is stable, nonimmigrant, and long-time residents of the community.¹⁶ Subjects were eligible if they were older than 18 years of age and NHW or MA members of a participating church, spoke English or Spanish, and were permanent residents of the Corpus Christi area. This project was approved by the University of Michigan’s Institutional Review Board and written informed consent was obtained from all participants.

Measurements

Subjects participated in a baseline and 12-month assessment in-home by a trained study coordinator. In both meetings, dietary data were obtained by using the Block 2005 Food Frequency Questionnaire modified for a 6-month reference period and to include foods preferred by Hispanics. Dietary data were analyzed commercially.¹⁷ The total average daily sodium intake (in milligram) was obtained from considering all foods. The average total daily cups of fruit intake, including fruit juices, were used to calculate fruit consumption. Vegetable estimates included average total daily cups of vegetables including legumes but not potatoes. Standard procedures were used to eliminate dietary records that appeared invalid¹⁸ and to eliminate outliers for individual measures. The Stanford 7-Day Recall Physical Activity questionnaire was used to measure PA. PA was classified as light, moderate, and hard and very hard intensity, and we recorded the total metabolic equivalent of task (MET) minutes for the last 7 days for each category.¹⁹ Records wherein total PA estimates were outside the range of 13,230-46,620 METS-minute for the week were considered invalid reports. Because moderate or harder intensity, but not light PA, is considered beneficial, we used the weekly amount of moderate or higher intensity PA as the measure of PA in the present study. BP, the primary outcome measure in the current analysis, was measured by an automated device (OMRON-HEM-780).²⁰ The standard protocol was to seat subjects quietly for a minimum of 5 minutes, then to measure BP in the right arm (unless medically contraindicated) with the arm supported at the midsternal level. We took 3 consecutive readings and averaged the last two.²¹ The difference in BP change between the 2 visits was computed and used as the outcome in regression models. A binary variable of BP improvement was also created to reflect a conservative clinically meaningful change: a participant was categorized as improving BP if his/her SBP was reduced by 10 mmHg or more, or if his/her DBP was reduced by 5 mmHg or more. We chose this binary measure since it is proven to reduce stroke and coronary heart disease with well-defined risk reduction estimates from clinical trials.²² We also recorded the number of BP medications subjects were taking at baseline and at 12 months.

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