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Impact of Acculturation on Cardiovascular Risk Factors Among Elderly Mexican Americans

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Abstract

Purpose—Higher levels of acculturation among Latinos have been shown to be associated with a higher prevalence of cardiovascular risk factors in some studies of middle age persons. The association of acculturation and prevalence of cardiovascular (CV) risk factors in elderly Latinos is less well established.

Methods—Acculturation was measured using the validated bidimensional Acculturation Rating Scale for Mexican Americans-II. We conducted a cross-sectional analysis of the association of acculturation with prevalence of CV risk factors among 1,789 elderly men and women from the Sacramento Area Latino Study on Aging (SALSA) using multivariate linear and logistic regression. We tested for the interaction of acculturation with risk factors by nativity status.

Results—Median age was 69.8. Higher acculturation was associated with lower systolic blood pressure, lower LDL, higher HDL, and lower prevalence of cardiovascular disease after age and sex adjustment. Higher acculturation remained associated with lower LDL and higher HDL levels after full adjustment. Nativity status did not affect these results.

Conclusions—Contrary to other reports in middle-aged persons, higher levels of acculturation were associated with better lipid profiles and no significant differences in other CV risk factors by acculturation level in elderly Latinos.

Keywords

Hispanics; Acculturation; Cardiovascular risk factors

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Introduction

Latinos currently comprise 15% of the U.S. population. It is estimated that by 2050, 1 out of 3 United States (US) residents will be Latino (1). The Latino population is a heterogeneous mix of persons born in and outside the U.S., with different social, cultural, behavioral attitudes that may affect health. Acculturation is defined as a process whereby an immigrant culture adopts the beliefs and practices of a host culture (2–4). It is a complex multidimensional process with both positive and negative effects on lifestyle behaviors that may differentially influence the development of CV risk factors. Acculturation is an important factor that may explain the disproportionate health burden of CV risk factors among Latinos.

Generally, the acculturation process has been demonstrated to exert a deleterious effect on Latino health with greater acculturation associated with an unhealthy diet and less exercise over time (5–6). Prior studies have demonstrated that higher levels of acculturation among Latinos are associated with a higher prevalence of CV risk factors (2, 7–12). However, these studies have included primarily young and middle-aged persons. The association of acculturation and CV risk factors among elderly Latinos is not well known. Although a prior study among old Mexican Americans aged 75 or older living in the Southwest found increasing hypertension, diabetes and obesity prevalence from 1993–1994 to 2004–2005, the role of acculturation was not included (13).

As the U.S. population ages, understanding the importance of acculturation on CV risk factors among Latinos is of great importance in order to improve care for this population. We hypothesize that, contrary to findings in young and middle aged persons, higher acculturation does not have a deleterious effect on cardiovascular health among elderly Latinos for two reasons. First, greater acculturation may bring positive effects through increased insurance coverage with greater access to health care and use of preventive health services, improved socioeconomic status, and increased English language ability. Second, age at migration has been shown to modulate CV risk with those migrating earlier in life experiencing higher cardiovascular disease rates than later migrants (14). Thus, elderly Latinos who migrated later in life may not have the same CV risk. This study was designed to evaluate whether acculturation, measured with a multidimensional validated scale, is associated with lower prevalence of CV risk factors, among elderly participants in the Sacramento Area Latino Study on Aging (SALSA).

Methods

Study Population, Sampling, Recruitment, and Response Rate

Study participants were residents of the Sacramento Metropolitan Statistical Area and surrounding suburban and rural counties in California (15). An eligible person was aged 60 or older in 1998 and self-designated as Latino. The first stage of the sampling involved identifying 1990 Census tracts in five contiguous counties and characterizing them by the percentage of eligible residents (aged ≥60 and Latino). These tracts were ranked in order of percentage eligible, and all tracts in which the percentage eligible was at least 5% were

selected for the target population. Because the recruitment occurred 8 years after the 1990 Census, a phone and address list was purchased of people aged 60 and over with Latino surnames in the target area. This list was used to identify census tract areas where there might have been a change in the eligible population since 1990 and to contact individuals in the selected census tracts.

Participants were contacted in three stages: by mail, by phone, and, finally, by door-to-door neighborhood enumeration. The overall response rate in those contacted was 85%. At baseline (1998–99), 1,789 people were enrolled in the study. The sample was highly representative of older Hispanics residing in the target area when compared demographically to the 1998 Census dress rehearsal (15).”

Data Collection

All field staff was bilingual in Spanish and English, and participants were interviewed in their language of choice. All data collection was done at the participants’ homes. In a 2-hour interview, each participant answered questions about lifestyle factors, acculturation, and medical diagnoses. Blood pressure and ankle:arm blood pressure were measured, and fasting blood was drawn for measurement of lipids, and glucose. Prescription medication was obtained by a medicine cabinet inventory at the annual home visit and coded into groups using the CDC ambulatory drug database.

Exposure—Acculturation was measured using the Acculturation Rating Scale for Mexican Americans—Version II (ARSMA-II) (16). This instrument assesses such information as whether an individual prefers Spanish or English media and about contacts with their country of origin and with people of Latino and Anglo backgrounds. This scale is an improvement over language only based scales by including multiple domains of identity, behaviors and interpersonal relationships. ARSMA-II is widely used to assess the degree of cultural adaptation of Mexican Americans into the Anglo culture. The scale was formed so that the least affiliation with Anglo cultured was scored as 0, and the items were summed to form a scale from 0 to 63.

Outcomes—Fasting glucose level was measured from blood drawn at each visit. Diabetes was defined by self-report of a physician diagnosis, use of diabetes medication, and/or a fasting glucose level greater than or equal to 126 μg/dl (ADA). Blood pressure was measured twice using standard blood pressure protocols Baseline hypertension was defined based on self-report of a MD diagnosis or a baseline systolic blood pressure greater than or equal to 140 mm Hg or a baseline diastolic blood pressure greater than or equal to 90 mm Hg, or use of antihypertensive medication (17). History of stroke was defined by self-report of an MD diagnosis, including hospitalization for stroke. CV risk factors for coronary heart disease include the following risk factors measured at baseline: age, gender, fasting low density lipoprotein (LDL) and high density lipoprotein (HDL) cholesterol, blood pressure (and also whether the patient is treated or not for his/her hypertension), diabetes, and smoking. The Framingham risk score was calculated for each participant using the standard algorithm (http://cvdrisk.nhlbi.nih.gov/calculator.asp). Anthropometric measures such as height (in cm) and weight (in kg) were measured. Body mass index (weight in kilograms

divided by height in meters squared) was derived and classified as normal (<25.0), overweight (25.0–29.9), or obese (≥30). Participants reported their baseline smoking status (current, former or never),

Covariates—Participant's education was obtained at the baseline interview by asking how many years of education they had completed. Participants also reported their current monthly household income in categories, which was split at the median with low (income < $1,500) or high (income greater ≥$1,500) for this analysis. Participants also reported whether or not they had health insurance. Nativity was based on the participant's self-report of their country of birth. Participants were either born in the United States or born in the Mexico and migrated to the United States. Prior analysis of the SALSA cohort shows a bimodal distribution of acculturation by nativity status with lower acculturation scores clustering around foreign born participants. For participants born in Mexico and missing migration age from follow-up visit 6, we obtained migration age by subtracting the number of years the participant reported being in the US at the first semi-annual phone interview from his/her age at that interview. Alcohol consumption was categorized as frequent (daily), moderate (weekly), occasional (monthly), and yearly/rarely/never. Our measure of physical activity was self-reported walking pace outdoors. It was categorized into three levels: 1) never walks outdoors/unable to walk, 2) easy, casual/normal, average, and 3) brisk pace/ very brisk/striding.

Statistical Analysis

Descriptive statistics of the study population were compared across the two acculturation groups (high vs. low). High acculturation was defined as acculturation score greater than or equal to the IQR. An IQR is a measure of statistical dispersion, being equal to the difference between the upper and lower quartiles. The IQR range was chosen because single point differences of the acculturation scale are difficult to interpret since a one point change on the scale does not necessarily translate easily to 'higher' or 'lower' acculturation. Two-tailed chi-square tests for categorical variables and one-way analysis of variance for continuous variables were used to test for differences between the high and low acculturation groups. Pearson correlations were calculated between migration age and acculturation.

A series of multivariate linear or binary logistic regression models were utilized to assess the association between acculturation and each risk factor as the dependent variable. The main independent variable was acculturation modeled as a continuous variable per interquartile range increase. Model 1 presents the association of acculturation and the outcome. Model 2 adjusts for age and sex. Model 3 adjusts for the following: age, sex, monthly income >= $1500, marriage status, physical activity level, current smoking status, alcohol consumption, medical insurance and medication use. An ordinal logistic regression model was used to predict the odds ratio of being in a higher category of BMI. Models met the proportional odds model assumption. Finally, we tested for the interaction of acculturation with nativity status on each FRF.

Results

There were 1789 participants with a slightly larger number of low acculturation participants (886 vs. 829) who were more likely to be foreign born compared to those of high acculturation (83.1% vs. 16.9%). Migration age was negatively correlated with acculturation (pearson correlation coefficient ($\rho = -0.55$, $p<0.0001$). Nativity was also negatively correlated with acculturation (pearson correlation coefficient ($\rho = -0.67$, $p<0.0001$).

Compared to participants with low acculturation, higher acculturated participants were slightly younger, more likely to be male, have more education, have a higher monthly income, and have insurance (Table 1). Additionally, participants with higher acculturation levels had a slightly lower SBP, were less likely to report a history of CVD, have lower LDL levels and higher HDL levels, have lower eGFR creatinine levels and have a lower Framingham Risk Score. The highly acculturated were more like to use medications and were more likely to engage in brisk exercise, and to drink alcohol. There were no significant differences between the two groups in diabetes status, fasting glucose levels, hypertension status, current smoking rates, hypercholesterolemia status, BMI levels, and total cholesterol levels.

In the unadjusted model, (Table 2, Model 1), higher acculturation is associated with lower SBP and LDL levels but higher HDL level. In the fully adjusted model (Table 2, Model 3), older age and the use of antihypertensive medication is associated with an increase in SBP while women had a lower SBP. Total cholesterol was not statistically associated with acculturation in either the unadjusted or adjusted models. Women were found to have significantly higher total cholesterol in adjusted models. Increasing acculturation was statistically associated with higher HDL and lower LDL in unadjusted and fully adjusted models. In the adjusted models, women had higher HDL and those using a statin had a lower LDL.

Acculturation was not significantly associated with diabetes, current smoking status nor BMI level (table 3). Increasing age and women participants had lower odds of having diabetes and of being current smokers. High Acculturation is statistically associated with lower odds of having a history of cardiovascular disease in the unadjusted model but not in the fully adjusted model. There was no significant interaction of acculturation with nativity status on each FRF.

Discussion

In contrast to prior studies in young and middle-aged persons, we found that higher levels of acculturation were associated with lower levels of LDL, higher levels of HDL, lower rates of CVD history and a lower median Framingham risk score in this primarily Mexican and Mexican-American cohort of older participants. Contrary to the detrimental effect of increasing acculturation in younger populations, we found no significant differences in other risk factors by acculturation level in an elderly cohort. Our findings suggest that the impact of acculturation on CV risk factors may differ for elderly Latinos.

This is contrary to many reports in primarily young and middle-aged persons demonstrating deleterious CV risk factor profiles with increasing acculturation (2, 7–12). Most recently, the Hispanic Community Health Study/Study of Latinos (mean age in the 40s) with >15,000 Latinos across the US found that higher acculturation was associated with higher rates of adverse CV risk factors and self-reported coronary heart disease and stroke (18). Two prior studies examining the association of acculturation on CV risk factors among older Latinos greater than 65 years of age were limited by the use of proxy imperfect measures of acculturation (14, 19). Our study is the only one using a multidimensional validated acculturation scale.

This study uses a multidimensional validated acculturation scale which is an improvement over many other CV risk profile studies that have used proxy measures (i.e., language, nativity, etc.). Research has consistently called for use of scales that capture the complexity of the sociocultural aspects of acculturation through assessment of beliefs, values, attitudes and behaviors (2–4, 20–22). Although acculturation has been generally shown to have a cumulative inverse association with CV risk factors, the acculturation process is complex, with potential both positive and negative effects over time. Acculturation can have a positive effect through improved socioeconomic status, increased insurance coverage with greater access to health care and use of preventive health services, and increased English language ability allowing for higher social and human capital (2–4). We found three positive associations with increasing acculturation. First, SALSA participants had high rates of medical insurance regardless of acculturation level (low acculturation: 85%/high acculturation: 97%). Second, we found that higher acculturation was associated with higher rates of risk factor modification medication. Third, higher acculturation was associated with increased physical activity.

Although low socioeconomic levels in Latinos have been associated in some studies with lower CV risk factor profile and overall mortality (the ‘Hispanic paradox) (23–25),’ there is no Hispanic paradox in CV risk profiles especially for US born Latinos who have increased CV risk factor burden compared to NHW (26–28). This difference in CV risk factor burden and mortality has often been attributed to the deleterious effects of acculturation (2). The deleterious effects of acculturation are hypothesized to occur in a cumulative fashion with accumulation of risk and clustering of risk factors over the life course (29). We have found in prior work that only 21% of the SALSA cohort had migrated at 50 years of age or older (13). The majority (62%) had migrated early in life (at < 20 years old) and thus suggests that the cumulative negative effects may be counterbalanced by positive effects of acculturation. In addition, our positive acculturative associations are in the context of an elderly Latino cohort with high rates of low socioeconomic status which is generally associated with poor health outcomes. Only 15% of low acculturated Latinos and almost 50% of highly acculturated Latinos had a monthly income greater than or equal to $1500. In addition, both acculturation groups had low education attainment with even highly acculturated Latinos having a mean of 10 years of education. Acculturation has been associated with having a ‘protective effect’ against low SES health effects (12, 30–33).

Our findings highlight that there is no simple unified acculturative process that leads to one general negative health outcome. There are likely multiple acculturative trajectories that

encompass the individual's life course including factors such as socioeconomic level changes, migration history, and country of origin (4, 34–35). These differing assimilation trajectories are associated with variations in perceived quality of life, self-rated health status, disease risks and health-related outcomes possibly explaining the observed variations in these variables among studies of Latino health (36–37).

Our study has several limitations. First, our findings may represent a survivor effect among elderly Mexicans and Mexican-Americans in the cohort but this is a challenge for all cohorts of elderly participants. Elderly participant cohorts are essential for understanding cardiovascular risk factors and their impact on morbidity and mortality. In addition, the healthy immigrant selection effect is unlikely to contribute to explaining our findings in this case since the participants in the SALSA cohort had an average time of 35 years of being in the US. Second, SALSA participants are primarily limited to Mexico. Prior research has demonstrated varying CV risk factor distribution among Latinos by country of origin (38–40). Third, our cohort had higher rates of insurance and possibly health care access as compared to other national and California based cohorts such as NHANES and the California Health Interview Survey. This latter point may be due to the age of the group and their eligibility for Medicare. However, disparities in CV risk factor identification and management are well known and these disparities are only partially explained by insurance status and healthcare access (41). Finally, this is a cross-sectional analysis limiting causal inference.

Our study has several important strengths to highlight. First, prior studies have primarily focused on young and middle aged Latinos which has probably led to an incomplete understanding of how acculturation impacts Latinos at different ages and life stages. Secondly, few studies have examined the impact of acculturation on CV risk profiles in older Latinos in a well defined cohort with extensive survey and laboratory data. Third, SALSA uses a validated multidimensional acculturation instrument instead of proxy measures such as language. Thus, our main exposure variable has a more precise and complete measurement. In summary, the effect of acculturation is complex including but negative and positive influences. Our findings add to emerging research evidence which suggests that the effect of acculturation on cardiovascular risk factors may differ across the life course (34). Acculturation is a dynamic process and as a result may have a complex differential effect over time.

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Table 1

Acculturation by Demographic and Clinical Characteristics Among SALSA Participants.*

Variable	All Participants N=1789	Low Acculturation N=886	High Acculturation N=829	p-value*
Demographic Variables				
Age in years (Median ± SD)	69.8 ± 7.1	70.3 ± 7.6	69.2 ± 6.6	0.0002
Gender				
Male	745 (41.6)	351 (39.6)	361 (43.6)	0.10
Female	1044 (58.4)	535 (60.4)	468 (56.5)	
Education (years)	7.2 (5.3)	4.1 (4.1)	10.6 (4.5)	<.0001
Monthly Income >= $1500	608 (34.7)	133 (15.4)	451 (54.9)	<.0001
Medical Insurance	1610 (90.7)	750 (84.8)	805 (97.2)	<.0001
Married	1031 (58.0)	514 (58.0)	482 (58.2)	0.93
Foreign Born	910 (51.1)	736 (83.1)	140 (16.9)	<.0001
Clinical Variables				
Diabetes	586 (32.8)	285 (32.2)	283 (34.1)	0.39
Fasting glucose (mg/dL)	115.0 (46.2)	113.5 (45.4)	116.0 (45.9)	0.10
Hypertension	1208 (67.6)	590 (66.6)	569 (68.6)	0.37
Current smoker	203 (11.4)	103 (11.7)	91 (11.0)	0.67
SBP (mmHg)	138.3 (19.4)	139.5 (19.7)	137.3 (19.0)	0.02
Hypercholesterolemia	980 (59.9)	471 (59.6)	475 (60.2)	0.81
BMI (kg/m^2)				
<25	311 (20.8)	150 (20.7)	151 (21.0)	0.73
25–29	500 (33.4)	250 (34.5)	234 (32.6)	
≥30	688 (45.9)	325 (44.8)	334 (46.5)	
History of Cardiovascular Disease	659 (36.8)	350 (39.5)	285 (34.4)	0.03
LDL (mg/dL)	122.6 (34.5)	124.4 (34.0)	120.6 (35.2)	0.03
HDL (mg/dL)	51.8 (13.6)	51.2 (13.3)	52.6 (13.8)	0.04
Total Cholesterol (mg/dL)	211.9 (40.0)	212.1 (39.9)	211.3 (40.3)	0.70
eGFRcreat (mL/min per 1.73 m^2)	84.8 (24.4)	86.4 (25.6)	83.6 (23.3)	0.02
Framingham Risk Score (Median ± SD)	10.0 ± 3.3	10.0 ± 3.3	9.0 ± 3.2	0.0003
Medications				
Statins	146 (8.2)	61 (6.9)	82 (9.9)	0.02
Antihypertensive agents	761 (42.6)	350 (39.5)	379 (45.7)	0.01
Diabetes medications	374 (20.9)	179 (20.2)	182 (22.0)	0.37
Physical Activity				
Never walks outdoors/unable to walk	75 (4.4)	35 (4.2)	38 (4.7)	<.0001
Easy, casual/normal, average	1321 (78.3)	686 (83.1)	592 (73.8)	
Brisk pace/very brisk/striding	292 (17.3)	105 (12.7)	172 (21.5)	
Alcohol consumption				
Frequent (daily) drinker	155 (8.8)	65 (7.4)	83 (10.1)	<.0001

Variable	All Participants N=1789	Low Acculturation N=886	High Acculturation N=829	p-value*
Moderate (weekly) drinker	185 (10.5)	63 (7.2)	117 (14.2)	
Occasional (monthly) drinker	163 (9.3)	60 (6.9)	99 (12.0)	
Yearly/rarely/never drinker	1260 (71.5)	686 (78.5)	527 (63.8)	

*Data in continuous variables are shown as Mean (SD), unless otherwise noted, and data in categorical variables are shown as N (%). High acculturation is defined as acculturation score>= interquartile range=24.

Table 2

Association of Acculturation to Individual Cardiovascular Risk Factors from Linear Multivariate Regression Models.

Framingham Risk Factors	Model 1		Model 2		Model 3	
	β Estimate	95% CI	β Estimate	95% CI	β Estimate	95% CI
Systolic Blood Pressure mmHg						
Acculturation score (IQR: 24 unit)	−1.94	−3.71, −0.17	−0.90	−2.99, 1.19	−1.37	−3.43, 0.69
Age			0.46	0.31, 0.62	0.42	0.27, 0.57
Female			−3.06	−5.30, −0.82	−2.86	−5.06, −0.65
Antihypertensive medication					6.96	5.01, 8.90
Total Cholesterol (mg/dL)						
Acculturation score (IQR: 24 unit)	−1.35	−5.02, 2.32	−1.90	−6.23, 2.43	−1.65	−5.99, 2.68
Age			−0.09	−0.41, 0.23	−0.09	−0.41, 0.23
Female			12.84	8.20, 17.47	12.81	8.18, 17.45
Statin Use					−6.82	−13.78, 0.14
HDL (mg/dL)						
Acculturation score (IQR: 24 unit)	1.55	0.31, 2.79	1.56	0.16, 2.96	1.54	0.14, 2.94
Age			0.04	−0.06, 0.15	0.04	−0.06, 0.15
Female			10.71	9.21, 12.21	10.71	9.22, 12.21
Statin Use					0.51	−1.74, 2.75
LDL (mg/dL)						
Acculturation score (IQR: 24 unit)	−3.69	−6.87, −0.52	−4.82	−8.65, −0.99	−4.44	−8.26, −0.62
Age			0.26	−0.02, 0.54	0.26	−0.02,0.54
Female			1.51	−2.59, 5.61	1.45	−2.64,5.54
Statin Use					−9.87	−16.01, −3.72

*Model 3 adjusts for: **Age, Sex**, Monthly Income >= $1500, Married, Physical Activity, Current Smoker, Alcohol consumption, Medical Insurance and Medication Use.

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Table 3

Association of Acculturation to Individual Cardiovascular Risk Factors from Logistic Multivariate Regression Models.

Framingham Risk Factors	**Model 1**		**Model 2**		**Model 3**	
	Odds Ratio	**95% CI**	**Odds Ratio**	**95% CI**	**Odds Ratio**	**95% CI**
Diabetes (Yes/No)						
Acculturation score (IQR: 24 unit)	1.05	0.87, 1.26	1.03	0.85, 1.24	1.21	0.96, 1.53
Age			0.99	0.98, 1.00	0.97	0.96, 0.99
Female			0.87	0.71, 1.07	0.59	0.46, 0.75
Current Smoker (Yes/No)						
Acculturation score (IQR: 24 unit)	1.00	0.76, 1.32	0.91	0.68, 1.20	0.95	0.67, 1.36
Age			0.97	0.95, 0.99	0.96	0.94, 0.99
Female			0.44	0.33, 0.60	0.46	0.32, 0.67
History of Cardiovascular Disease (Yes/No)						
Acculturation score (IQR: 24 unit)	0.82	0.68, 0.98	0.85	0.71, 1.02	0.99	0.80, 1.24
Age			1.02	1.01, 1.04	1.01	0.99, 1.02
Female			1.19	0.97, 1.45	1.03	0.81, 1.31
BMI (Odds of being in a higher category compared to normal BMI)**						
Acculturation score (IQR: 24 unit)	0.94	0.79, 1.13	0.91	0.76, 1.09	0.93	0.75, 1.16
Age			0.96	0.94, 0.97	0.95	0.93, 0.96
Female			1.09	0.89, 1.32	1.13	0.89, 1.43

*Model 3 adjusts for: **Age, Sex**, Monthly Income >= $1500, Married, Physical Activity, Current smoker (not adjusted for in model with current smoker as outcome), Alcohol consumption, Medical Insurance.

**Ordinal logistic regression models.