

Acculturation and Blood Pressure in a Community-Based Sample of Chaldean-American Women

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With the steady increase of non-European, non-English speaking immigrants to the United States, the relationship between acculturation and risk for cardiovascular disease (CVD) is an issue of growing importance to researchers interested in the health of new immigrant populations. The influence of acculturation processes on adverse changes in blood pressure (BP), a major risk factor for CVD, has been examined in Hispanic-Americans and Asian-Americans. Published studies on this relationship in Arab-Americans are lacking, however, despite their growing numbers. With a specific focus on Chaldean-Americans, a major subgroup of the large Arab-American population located in metropolitan Detroit, Michigan, the current study investigates the influence of level of acculturation on BP in a community probability sample of 130 Chaldean-American women. Study participants were interviewed in their homes (92% response rate). Physical measurements included BP, body mass index (BMI), and waist-hip ratio. Demographic and acculturation data were obtained through a standardized questionnaire. The crude hypertension prevalence in the sample was 16%. Three dimensions of acculturation were identified through content and factor analysis: English language preference, parental school involvement, and ethnic identity. In unadjusted analyses, both English language preference and Chaldean-American ethnic identity were associated ($p < 0.01$) with lower mean BP, but these differences became nonsignificant when age, BMI, and waist-hip ratio were statistically controlled. Parental school involvement was not associated with BP in any analyses. In this study, the strongest predictors of BP were BMI and waist-hip ratio, both of which were inversely correlated with age, education, English language preference, employment outside the home, and parental school involvement. Future studies of acculturation and BP in Chaldean-Americans (and other Arab-American populations) should use improved measures of acculturation, broader assessments of behavioral and socioeconomic status, and larger samples that includes both genders.

KEY WORDS: Blood pressure; Chaldean-Americans; Arab-Americans; acculturation; ethnic identity.

INTRODUCTION

High blood pressure is one of the major modifiable risk factors for coronary heart disease (CHD), stroke, peripheral vascular disease, and renal failure.

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In the United States, as many as 50 million Americans aged 6 and older had high blood pressure in 1996. Hypertension was directly responsible for 41,634 deaths in 1996 and contributed to the deaths of more than 200,000 people (1). Established risk factors for hypertension include positive family history, older age, male gender (under age 45), obesity, tobacco use, excessive alcohol intake, lack of exercise, and high sodium/potassium ratio (2). Chronic stress is also a suspected risk factor (3).

Research has established the importance of the above risk factors for the general U.S. population (4, 5). For immigrants to the United States, stress due

to acculturation may represent an additional risk factor (6, 7). Acculturation is a complex, multifaceted process; however, one widely accepted definition of acculturation was offered by Redfield *et al.* (8): “those phenomena which result when groups of individuals having different cultures come into continuous first-hand contact, with subsequent changes in the original culture patterns of either or both groups” (p. 9).

The hypothesis that increasing acculturation to mainstream U.S. society among immigrants might be associated with higher resting blood pressure (BP) has been suggested in recent work on Hispanic-Americans (9–11) and Asian-Americans (12, 13). To our knowledge, no studies of acculturation and BP among Arab-Americans that used community-probability sampling strategies have been published. Arab-Americans are one of the country’s fastest growing immigrant populations (14). In the state of Michigan, where approximately 250,000 Arab-Americans reside, 1996 self-report data suggested that 31% of persons who self-identified as Arab-Americans might be hypertensive (14).

The Arab-American population is quite heterogeneous in terms of ethnic background, lifestyles, and religious preferences. The example of the Chaldeans illustrates this point. Most Chaldeans originated from the northern part of Iraq, where they trace their roots to the small farming village of Telkaif, 10 miles north of Mosul. Chaldeans are Catholics belonging to the Roman Catholic Church; they constitute less than 1% of Iraq’s population. The language spoken by the Chaldeans is a modern-day dialect of Aramaic. The first known immigrant from Telkaif to the United States arrived in Philadelphia in 1889. The immigrants who followed in 1910–1912 headed for Detroit. After World War II, a new wave of Chaldean immigrants arrived in Detroit. These immigrants were better educated than the original group. They spoke Chaldean and Arabic; few spoke English well (15). In 1998, there were about 100,000 Chaldeans in the United States, with approximately 80,000 of them residing in Michigan, the largest population of Chaldeans outside of Iraq (16).

The number of Chaldean-Americans is growing rapidly, from about 1,500 in the early 1960s to more than 80,000 in 1998 (16). The adjustments they and other immigrant populations are making to American society and the relationship between these adjustments and health status are issues of growing importance to the public health community (17–20). The current study focuses on Chaldean-American women for three reasons: (1) they play a central role in man-

aging family social interactions (especially those centering on children) with institutions in mainstream U.S. society; (2) they have been underrepresented in the handful of health-related studies conducted of Arab-Americans (21–24); and (3) the first author (FJD) is of Chaldean descent and has language proficiency in both English and Chaldean. The specific research objective is to quantify the association between select dimensions of acculturation and BP in a community-probability sample of Chaldean-American women.

METHODS

Study Population

Chaldean-American women who were between 35 and 45 years of age in 1998 and who resided in one of five neighborhoods in metropolitan Detroit were eligible to participate in this study. The five neighborhoods were Oak Park, Southfield, Farmington Hills, Sterling Heights, and Detroit. Potentially eligible participants were contacted using the 1998 Chaldean-American Directory (25), which is maintained by the Chaldean Diocese of America and updated annually. It contains addresses and phone numbers of 95% of all Chaldean-Americans residing in Michigan (26).

Every eighth name appearing in the directory was selected, the initial household contact was made by phone. The “woman of the house” was identified and briefly interviewed to determine her eligibility. One hundred sixty women were contacted. Eleven refused to participate, 3 were excluded because they were currently pregnant, 6 were excluded because they were under age 35, and 10 were excluded because they were over age 45. The final sample size was 130, with a response rate of 92%.

Study Variables

Study participants were interviewed in their homes by the first author (FJD), who was certified to measure BP according to American Heart Association criteria (27). Using a standard mercury sphygmomanometer, three consecutive, sitting BPs were taken on the right arm of each participant after she had rested for approximately 10 minutes. Systolic and diastolic blood pressure were estimated by averaging the second and third readings. Hypertension was de-

defined as systolic blood pressure (SBP) equal to or greater than 140 mmHg, or a diastolic blood pressure (DBP) equal to or greater than 90 mmHg, or currently taking antihypertensive medication. Weight (in pounds), height (in inches), and the circumferences (in inches) of the waist and hips were also measured with the women wearing light clothing and no shoes. These data permitted the calculation of body mass index (BMI) and waist–hip ratio scores.

Information was collected on psychosocial and economic resources, including education, marital status, number of children, number of years in the United States, and employment status. The survey instrument also assessed five components of acculturation: language preference (6 questions); parental school involvement (5 questions); ethnic identification (3 questions); media and diet preference (3 questions), and maintenance of cultural traditions (7 questions). Each question was scored on a 3-, 4-, or 5-point Likert scale, with lower scores indicating lower levels of acculturation.

The language preference, ethnic identification, and media and diet preference questions were adopted from Rissel's (28) acculturation scale. The parental school involvement and maintenance of cultural traditions were added based on focus group data obtained from Chaldean women prior to developing the questionnaire for this study.

Factor analysis, using a varimax rotation and significant loadings at the 0.50 level, revealed two main factors: language preference and parental school involvement. Although ethnic identity did not emerge as a discrete factor, an ethnic identity question was also included as a predictor because of its potential theoretical importance for understanding acculturation processes.

The following variables were considered potential confounders of the relationship between BP and the acculturation variables: age, education, BMI, and waist–hip ratio.

Data Analysis

Descriptive analyses included the calculation of means, standard deviations and, as appropriate, percentages for the three acculturation variables: language preference, parental school involvement, and ethnic identification. Multiple linear regression was used to estimate the association between each of the three acculturation variables with SBP and DBP. Specifically, for each acculturation variable, four hi-

erarchical regression models were constructed, in which model 1 provided the unadjusted estimate; model 2 controlled for education; model 3 added age as a covariate; and model 4 added BMI and waist–hip ratio. Separate multiple linear regression analyses were also performed, including and excluding an indicator variable for hypertension medication status. SPSS statistical software (29) was used for these analyses.

RESULTS

The prevalence of hypertension in this sample was 16% ($N = 21$); 11 (52%) of these individuals were taking antihypertensive drug therapy, and 10 (48%) were untreated.

Table I presents descriptive statistics of the study population for the three main predictor variables—language preference, parental school involvement, and ethnic identification. Women who were less acculturated on language preference (i.e., spoke “mostly Chaldean”) were older, had higher waist–hip ratios, and higher mean SBP values. Consistent with the finding for language preference, less acculturated women also had lower levels of education, were less likely to be employed, and had fewer years of residence in the United States. No significant differences were observed for marital status, BMI, and mean DBP.

Concerning parental school involvement, women who were less acculturated (i.e., were “not very involved” in their children's school) also had lower levels of education. No significant differences were observed for mean age, employment, marital status, duration in United States, BMI, waist–hip ratio, mean SBP, and mean DBP.

For ethnic identification, women who were less acculturated (i.e., identified as “only Chaldean”) were less likely to be employed, had fewer years in the United States, higher BMI, higher mean SBP, and mean DBP values. No significant differences were observed for age, education, marital status, and waist–hip ratio.

To identify the underlying conceptual dimensions of the Chaldean-American Acculturation Scale, factor analysis of scale items, using varimax rotation, was conducted (Table II). Four factors with eigen values greater than 1.0 resulted. Factor loadings ≥ 0.50 were used to identify the underlying factors. Factor 1, represented by six items (Cronbach's $\alpha = 0.89$), emphasized an English language preference

Table I. Characteristics of the Study Population^a

Characteristic	Language preference			<i>p</i> value
	Mostly Chaldean Mean (<i>SD</i>)	Chaldean & English Mean (<i>SD</i>)	Mostly English Mean (<i>SD</i>)	
<i>N</i>	35	41	41	
Age (years)	42.9 (3.1)	41.5 (2.9)	40.4 (3.2)	.028 ^b
Education	7.1 (4.0)	10.3 (3.3)	11.6 (3.1)	.001 ^c
Employed outside home (%)	38.9	43.1	65.9	.039 ^b
Married (%)	100.0	95.1	92.7	.274
Duration in United States (years)	10.9 (8.4)	17.9 (8.7)	22.4 (6.2)	.000 ^c
BMI	26.5 (5.0)	24.6 (4.3)	21.6 (3.2)	.069
WH Ratio	.81 (.05)	.79 (.06)	.77 (.08)	.018 ^b
MSBP	118.4 (11.8)	118.5 (11.9)	111.3 (7.0)	.005 ^c
MDBP	81.4 (9.2)	79.8 (9.9)	75.3 (6.2)	.081

Characteristic	Parental school involvement			<i>p</i> value
	Not very involved Mean (<i>SD</i>)	Somewhat involved Mean (<i>SD</i>)	Very involved Mean (<i>SD</i>)	
<i>N</i>	35	41	14	
Age (years)	41.8 (3.4)	40.6 (3.0)	40.3 (3.5)	.801
Education	7.5 (4.4)	10.7 (2.9)	13.4 (3.0)	.000 ^c
Employed outside home (%)	40.0	58.5	57.1	.242
Married (%)	94.3	97.6	92.9	.683
Duration in United States (years)	14.1 (10.1)	17.1 (7.9)	22.0 (2.5)	.241
BMI	25.6 (4.4)	23.2 (4.0)	20.5 (3.0)	.065
WH Ratio	.80 (.07)	.79 (.07)	.77 (.04)	.439
MSBP	117.8 (10.6)	116.0 (11.0)	113.0 (8.0)	.528
MDBP	80.3 (8.3)	78.1 (9.4)	75.4 (8.1)	.680

Characteristic	Ethnic identification			<i>p</i> value
	Only Chaldean Mean (<i>SD</i>)	Mostly Chaldean Mean (<i>SD</i>)	Chaldean-American Mean (<i>SD</i>)	
<i>N</i>	69	21	40	
Age (years)	41.8 (3.3)	40.6 (3.7)	41.0 (3.0)	.258
Education	9.1 (4.3)	11.1 (3.4)	10.7 (3.5)	.035
Employed outside home (%)	40.6	47.6	70.0	.012 ^b
Married (%)	89.9	90.5	92.5	.899
Duration in United States (years)	14.3 (9.4)	19.2 (9.1)	19.0 (8.6)	.012 ^b
BMI	25.2 (5.4)	23.3 (3.9)	22.6 (3.7)	.017 ^b
WH Ratio	.80 (.07)	.78 (.06)	.77 (.06)	.075
MSBP	118.3 (11.4)	114.3 (11.3)	112.8 (8.2)	.025 ^b
MDBP	80.4 (9.1)	77.1 (7.7)	76.1 (8.1)	.031 ^b

^aBMI = body mass index; WH Ratio = waist-hip ratio; MSBP = mean systolic blood pressure; MDBP = mean diastolic blood pressure.

^b*p* ≤ .05.

^c*p* ≤ .01.

Table II. Varimax Factor Analysis Solution for the Chaldean-American Acculturation Scale

Domains and items	Factor loading			
	Factor 1	Factor 2	Factor 3	Factor 4
English language preference				
1. Language spoken at home	.697			
2. Language spoken with friends	.666			
3. Language preference	.739			
4. Language in which you think	.645			
5. Language spoken to children	.756			
6. Language in which children respond	.664			
Parental school involvement				
12. Help children with homework		.747		
13. Read to children as part of homework		.802		
14. Read to children for recreation		.662		
15. Attend PTA meetings		.643		
16. Contact with teachers		.640		
Ethnic identification				
7. Chaldean self-identify			.661	
19. Prefer child marry a Chaldean			.786	
20. Prefer to arrange child's marriage			.579	
Participation in Chaldean activities				
9. Attend recreational or religious events				.636
11. Watch Chaldean/Arabic television or video				.557

and accounted for 67.6% of the variance in scores; factor 2, represented by five items (Cronbach's $\alpha = 0.80$), emphasized parental involvement in the child's school and accounted for 9.7% of the variance in scores; and factor 3 contained three items (Cron-

bach's $\alpha = 0.53$), with high scores representing strong identification with Chaldean ethnicity and traditions governing mate selection. This factor (ethnic identity) accounted for 6.4% of the total variance in scores. Factor 4 consisted of only two items, and

Table III. Bivariate Correlations among Study Variables: Chaldean-American Women, Detroit, Michigan

Variable	SBP	DBP	Age	Education	Employment	BMI	WHR	ELP	PSI	EI	YUSR
SBP	1.0										
N	130										
DBP	.74 ^b	1.0									
N	130	130									
Age (years)	.22 ^b	.32 ^b	1.0								
N	130	130	130								
Education	-.18 ^a	-.27 ^b	-.10	1.0							
N	130	130	130	90							
Employment	-.09	-.13	-.01	-.37 ^b	1.0						
N	130	130	130	130	130						
BMI	.42 ^b	.38 ^b	.22 ^a	-.44 ^b	-.22 ^a	1.0					
N	130	130	130	130	130	130					
Waist-hip ratio (WHR)	.39 ^b	.29 ^b	.26 ^b	-.33 ^b	-.24 ^b	.47 ^b	1.0				
N	129	129	129	129	129	129	129				
English language preference (ELP)	-.25 ^b	-.27 ^b	-.27 ^b	.49 ^b	.25 ^b	-.46 ^b	-.29 ^b	1.0			
N	118	118	118	118	118	118	117	118			
Parental school involvement (PSI)	-.10	-.15	-.18	.61 ^b	.17	-.41	-.26 ^a	.51 ^b	1.0		
N	90	90	90	90	90	90	90	90	90		
Ethnic identification (EI)	-.23 ^b	-.23 ^b	-.12	.20 ^a	.26 ^b	-.25 ^b	-.20 ^a	.48 ^b	.27 ^b	1.0	
N	130	130	130	130	130	130	129	118	90	130	
Years U.S. residency (YUSR)	-.19 ^a	-.14	.00	.20 ^a	.21 ^a	-.20 ^a	-.18 ^a	.58 ^b	.33 ^b	.24 ^b	1.0
N	130	130	130	130	130	130	129	118	90	130	130

^aSBP = systolic blood pressure; DBP = diastolic blood pressure; BMI = body mass index.

^a $p \leq .05$.

^b $p \leq .01$.

because of questionable reliability (Cronbach's $\alpha = 0.21$), it was not considered further.

The bivariate correlation matrix (Table III) identified several associations of interest. English language preference was inversely associated with mean SBP, DBP, age, BMI, and waist-hip ratio. Conversely, it was positively associated with education, employment, parental school involvement, and number of years in the United States. Chaldean-American (as opposed to Chaldean) ethnic identification was also inversely associated with mean SBP, DBP, BMI, and waist-hip ratio. Not surprisingly, Chaldean-American ethnic identification was positively associated with education, employment, English language preference, parental school involvement, and number of years in the United States. BMI, waist-hip ratio, and education were associated in expected ways with age and BP.

Scores on the parental involvement factor were unrelated to BP in this population. Patterns of association between BP and the other two dimensions of acculturation, English language preference and ethnic identity, were virtually identical. For parsimony, only the findings for English language preference are reported.

Table IV summarizes the association between English language preference and SBP. Model 1 tests this association unadjusted for other covariates. A preference for English was associated with significantly lower ($p < 0.01$) SBP. Adjusting for education (model 2) this inverse association weakened but persisted ($p < 0.01$). Adjusting for age (model 3), BMI, and waist-hip ratio (model 4) eliminated the association altogether, suggesting strong confounding of the original association by these three covariates.

Table V summarizes the covariate-adjusted relationships between English language preference and DBP. Model 1 tests this association unadjusted for other covariates. A preference for English was associ-

ated with significantly lower ($p < 0.01$) DBP. Model 2 indicates slight attenuation ($p < 0.05$) of the inverse association between DBP and English language preference when adjusted for education. Adjusting for age, BMI, and waist-hip ratio (model 4), the association between DBP and English language preference is completely eliminated.

When the regression analyses were repeated excluding the 21 treated hypertensives, the findings were virtually identical to those produced by the models discussed above; hence, the reported findings are generalizable to all 35- to 45-year-old women in the target population from which this sample was drawn.

DISCUSSION

The objective of this study was to assess the association between several indicators of acculturation to mainstream U.S. society and mean blood pressure levels among first-generation Chaldean-American women residing in metropolitan Detroit. The two major indicators of acculturation, preference to communicate in English and level of parental school involvement, were identified through factor analysis of questionnaire items developed specifically for this population. A third predictor, self-described ethnic identity, was retained for content validity reasons. Scores on the parental school involvement variable were not associated with BP in either unadjusted or adjusted analyses. A preference for the English language was initially inversely associated with lower BP, but this association was eliminated once age, BMI, and waist-hip ratio were taken into account. A Chaldean-American ethnic identity as opposed to a Chaldean (only) identity was similarly inversely associated with BP initially, but this association was also eliminated once age, BMI, and waist-hip ratio

Table IV. Unadjusted and Adjusted Regression Coefficients (\pm SE) for the Association between English Language Preference and Systolic Blood Pressure: Chaldean-American Women, Detroit, Michigan

Predictor	Model 1	Model 2	Model 3	Model 4
English language preference	-.46 (.17) ^b	-.40 (.20) ^a	-.29 (.20)	-.13 (.20)
Education		-.18 (.29)	-.21 (.28)	.15 (.28)
Age			.77 (.31) ^a	.38 (.31)
BMI				.57 (.24) ^a
Waist-hip ratio				42.2 (16.2) ^b

BMI = body mass index.

^a $p \leq .05$.

^b $p \leq .01$.

Table V. Unadjusted and Adjusted Regression Coefficients (\pm SE) for the Association between English Language Preference and Diastolic Blood Pressure: Chaldean-American Women, Detroit, Michigan

Predictor	Model 1	Model 2	Model 3	Model 4
English language preference	-.41 (.14) ^b	-.31 (.16) ^a	-.18 (.15)	-.11 (.16)
Education		-.29 (.23)	-.32 (.22)	.15 (.23)
Age			.83 (.25) ^b	.65 (.26) ^a
BMI				.34 (.20)
Waist-hip ratio				11.5 (13.5)

BMI = body mass index.

^a $p \leq .05$.

^b $p \leq .01$.

were statistically controlled. In the current study, there was no evidence of a curvilinear relationship between any of these indicators of acculturation and BP.

The most important predictors of BP in this study population were BMI and waist-hip ratio. Lower BMI and lower waist-hip ratio were associated with younger age, higher levels of education, a preference to communicate in English, and higher parental school involvement. Although BMI and waist-hip ratio may have confounded the association between the indicators of acculturation and BP in this study, it is also possible that high scores on these indicators influenced BMI and waist-hip ratio values. Higher levels of acculturation to U.S. society, as measured by language preference and frequency of contact with major cultural institutions (e.g., schools), could also be reflected in lower scores on standard measures of adiposity. In other words, psychosocial indicators of acculturation may strongly influence health habits (e.g., diet, exercise), which in turn affect body habitus. The cross-sectional nature of the current study prohibits the empirical examination of this possibility.

Other plausible explanations for the study findings include the possibility that BMI and waist-hip ratio were measured more accurately than the indicators of acculturation and thus predicted BP more reliably. Accurate measurement of psychosocial variables is never straightforward (30); however, the Cronbach alpha coefficients for both the English language subscale and the parental school involvement subscale were acceptably high in the current study. A related possibility is that beyond the absence of information on smoking and exercise, which some investigators consider important behavioral (31, 32) dimensions of acculturation, key psychosocial dimensions of acculturation were not represented among the study variables. The latter might include, for ex-

ample, the frequency, quality, and type of social interactions with family members and neighbors, and the racial or ethnic composition of social networks (33). A more expanded treatment of the psychosocial dimensions of acculturation, coupled with information on behavioral dimensions (e.g., recreational exercise, dietary habits) of acculturation would be important to include in future investigations.

Other limitations of the study include its small sample size and associated limited statistical power. Although the narrow 35- to 45-year-old age range helped control confounding by age, and significantly minimized the influence of menopausal status on BP level, potentially interesting statistical interactions involving the age variable could not be explored in the current study. A larger sample size and a broader age range, with due attention to important life course social and biological factors affecting women's risk for cardiovascular disease, should characterize future investigations.

This study also has several strengths. Its findings reinforce the importance of weight control for reducing risk for hypertension, not only among U.S.-born populations (34, 35), but also among immigrant populations (9, 17, 18). Blood pressure was measured using a well-established, standardized protocol (27). The study population was randomly selected, and the high response rate (92%) minimized bias due to selective participation. The measures of acculturation employed were developed specifically for this study population, and the factor analysis identified at least two theoretically coherent and internally consistent factors, which were then used to test the research question. Collectively, these positive features of the study underscore the feasibility of conducting sound, culturally sensitive studies of cardiovascular disease risk in Chaldean-American and other Arab-American communities.

To our knowledge, this is the first study to inves-

tigate the association between acculturation and BP in a Chaldean-American population. The 16% prevalence of hypertension in this relatively young sample of first-generation Chaldean-American women immigrants indicates that clinical hypertension may not be a rare condition in this population. Moreover, unpublished work by Hassoun (36) based on a non-probability sample of Chaldean-American women suggests that hypertension among middle aged and elderly women in this population could approach 50%. The potentially large burden of hypertension and related CVD disorders in this immigrant population further underscores the need for more (and larger) community-based studies. Such studies should include improved measures of acculturation as well as broader assessments of behavioral and socioeconomic risk factors than were represented in the current study. Future studies should also include men.

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