American Journal of Hypertension Research, 2014, Vol. 2, No. 1, 1-7
Available online at http://pubs.sciepub.com/ajhr/2/1/1

DOI:10.12691/ajhr-2-1-1

Associations of Sex, Age and Community Clinic with Hypertension and Dyslipidemia among Hispanics in Northeast Texas

Brianna F. Moore[1,*], William Sorensen[2], Patricia Bowden-Bryan[3]

[1]Department of Environmental and Radiological Health Sciences, Colorado State University, Fort Collins, CO, USA
[2]Department of Health and Kinesiology, University of Texas at Tyler, Tyler, TX, USA
[3]School of Nursing, University of Texas Health Science Center at Houston, Houston, TX, USA
*Corresponding author: Brianna.Moore@colostate.edu

Received June 16, 2014; Revised August 27, 2014; Accepted September 02, 2014

Abstract **Background:** Despite efforts to eliminate health disparities among Hispanics, inequalities still exist in the US. The purpose of this study is to evaluate the association between demographic factors (community clinic, age and sex) with systolic hypertension, diastolic hypertension and various dyslipidemias among Hispanics in Northeast Texas. **Methods:** Data were collected from 447 Hispanic adults aged ≥18 years from three types of community health clinics (a Federal Qualified Health clinic, a Community Health Center and a Faith-Based Organization). We used ANOVA models to assess mean differences in systolic blood pressure, diastolic blood pressure, total cholesterol, triglycerides, LDL, and HDL levels. Logistic regression models evaluated the associations between community clinic, age and sex with systolic hypertension, diastolic hypertension and various dyslipidemias. **Results:** A majority of participants did not complete high school and/or were uninsured. Additionally, two in five participants reported current unemployment. Significant differences in mean systolic blood pressure, diastolic blood pressure and HDL levels across community clinics were observed. When we stratified by sex, we found evidence of hypertension and dyslipidemia among Hispanic men from the Community Health Center serving seasonal/migrant workers. Hispanic men demonstrated markedly increased odds for systolic hypertension and low HDL levels. Finally, we identified a positive association between the Community Health Center and diastolic hypertension. **Conclusion:** We provide evidence of increased odds for hypertension and dyslipidemia among Hispanic men (as compared to women), participants from the CHC that served seasonal/migrant workers (as compared to the FQHC), and older participants (as compared to participants in the youngest age group). The poor health outcomes observed among the Hispanics in our study are not likely to improve following implementation of the Affordable Care Act without improved education and outreach. Therefore, we propose that policymakers and healthcare professionals should provide culturally relevant health education, specifically targeting Hispanic men and older Hispanics.

Keywords: *community clinics, health education, Hispanics, hypertension, dyslipidemia*

Cite This Article: Brianna F. Moore, William Sorensen, and Patricia Bowden-Bryan, "Associations of Sex, Age and Community Clinic with Hypertension and Dyslipidemia among Hispanics in Northeast Texas." *American Journal of Hypertension Research*, vol. 2, no. 1 (2014): 1-7. doi: 10.12691/ajhr-2-1-1.

1. Introduction

Despite efforts to reduce the disease burden among United States(U.S.) Hispanics, the disparity gap between Hispanics and other ethnicities still exists and the implications of this reality are alarming. Approximately half of Hispanics in the U.S. suffer from pre-diabetes and an additional 11% have type 2 diabetes, a figure that is disproportionately larger than the proportion among non-Hispanic whites. [1] Furthermore, Hispanic adults experience higher morbidity and mortality resulting from transient ischemic attack [1] and chronic kidney disease, [2] and children experience a higher prevalence of metabolic syndrome [3] and obesity. [4] Hispanics differ in their approach to disease screening, management, and treatment. Hispanics are less likely to undergo screening tests for cardiovascular disease, [5] or treat high blood pressure. [6] Treatment practices among type 2 diabetics further emphasizes this point; Hispanic diabetics are less likely than non-Hispanic white diabetics to self-monitor blood glucose, [7,8,9] have their dyslipidemia diagnosed, [10,11] and/or obtain an annual diabetic foot examination [12].

Limited access to healthcare is often cited as a leading cause of the disproportional incidence of chronic health conditions among minority populations. This may be precipitated due to stigmas in minority status, lack of resources (or knowledge of resources), unemployment, lack of health insurance, lack of time, limited access to transportation and inadequate health literacy. [13,14,15,16] Heisler et al. [17] have suggested that health disparities

are explained by the quality of healthcare facilities, as Hispanics are more likely to receive care at lower-performing facilities as compared to non-Hispanics whites. Other sociocultural barriers that discourage the use of healthcare include language barriers, cultural ties to family and religion, and a lack of cultural competence by healthcare providers. [17,18] Furthermore, among Hispanics living near the U.S.-Mexico border, the mere geographic proximity to the border may exacerbate the limited healthcare access and utilization [8,11,19].

1.1. Community Clinics

Due to their design and structure, community clinics often serve proportionately more low-income, unemployed, or uninsured individuals than private for-profit healthcare facilities. [20] The Affordable Care Act recently emphasized the need for quality-driven, cost-effective healthcare clinics; provisions in the bill have authorized state funding for the support of primary healthcare practices that can serve as medical homes (e.g. community clinics). [21] Furthermore, community clinics often attenuate the healthcare barriers experienced by Hispanics, including unemployment, lack of health insurance, and limited supply of Spanish-speaking healthcare providers/interpreters. [22] Three types of community clinics that serve low-income, unemployed, or uninsured individuals may include: Federally Qualified Health Centers (FQHCs), Community Health Centers (CHCs), and Faith-Based Organizations (FBOs) operating as community clinics. Under the supervision of the U.S. Department of Health and Human Services, FQHCs provide a cost-effective means of primary healthcare and improves equity in health. [23,24] Operated through local governments or non-profit organizations, community health clinics may be useful for reducing disparities among Hispanics. Compared with Health Maintenance Organization (HMO) patients, CHC patients are more likely to rate their healthcare experience favorably [25,26] and establish the clinic as their regular healthcare facility. [27] Similar to community health clinics, FBOs are privately funded, non-profit organizations that offer distinct advantages in reducing dyslipidemia and hypertension among patients. [26] Another advantage is the holistic integration of faith and health, [28] which may be particularly important among Hispanics who hold to orthodox (Catholic) or evangelical views about health [13,17].

1.2. Purpose

Among Hispanic adults, the lack of primary healthcare access and utilization are important factors contributing to health disparities within this ethnic group.[29]It is critical to identify educational opportunities for community clinics serving low income, unemployed and/or uninsured individuals in order to reduce the health disparity gap. The purpose of this study was to evaluate the associations of sex, age and community clinic(a Federal Qualified Health clinic, a Community Health Center and a Faith-Based Organization) with hypertension and dyslipidemia among Hispanics in Northeast Texas.

2. Methods

2.1. Participants and Data Collection

Our study examined data from three community clinics in Northeast Texas. We selected the clinics based on their primary goal of catering to low income, unemployed and/or uninsured individuals. All data were collected, analyzed, and documented by a licensed healthcare professional from each facility in 2006. The first clinic, a FQHC, offered data only from adult Hispanics with type 2 diabetes. The researchers utilized systematic randomized sampling for every tenth participant from an alphabetized list; the final sample size for this clinic was 93 participants. The second clinic, a faith-based organization, required participants to provide proof of employment prior to admission. The researchers utilized systematic randomized sampling, for every fifth participant. The third clinic, a CHC, had an organizational goal to provide healthcare to seasonal/migrant workers. This last clinic collected data in rural locations outside of the local Metropolitan Statistical Area (MSA) of Gregg/Smith counties but within 100 miles of the other clinics. The distribution of Hispanic adults from the community clincs are as follows: 93 from the FQHC (40.3%), 180 from the CHC (20.8%), and 174 from the FBO (38.9%).

2.2. Measures

Data from the three community clinics were merged into one dataset. Information included demographic variables, such as sex and age (collapsed into three categories: 18-30, 31-50, or 51+). Other measures included employment (unemployed or employed), highest level of education attained (completed high school or did not complete high school), country of birth (U.S., Mexico, or Central America), primary language spoken in the home (Spanish or English) and marital status (married/single). Access to healthcare was measured in terms of health insurance status (none, Medicare/Medicaid or private insurance). Clinicians recorded the self-report of physician-diagnosed type 2 diabetes and date of diagnosis. Due to the heterogeneity of type 2 diabetes status across community clinics, we excluded fasting plasma glucose from our analyses.

Blood pressure, cholesterol and glucose measures were obtained through the use of standard protocols during a single visit to each community clinic. Blood pressure was taken by trained physicians using manual sphygmomanometers in accordance with the standardized procedures [30]. Each participant took one blood pressure reading after resting quietly in a sitting position for five minutes. Blood specimens were collected for the determination of high density lipoprotein (HDL), low density lipoprotein (LDL), triglycerides, total cholesterol and glucose levels.

Systolic blood pressure, diastolic blood pressure, HDL, LDL, triglycerides, and total cholesterol were dichotomized prior to analyses. Systolic hypertension was dichotomized based a systolic reading of ≥140 mm Hg and diastolic hypertension was dichotomized based a diastolic reading of ≥90 mm Hg. [30] Low HDL was defined as serum levels <40 mg/dL for men and <50 mg/dL for women, which represents a high risk for coronary heart disease. [31] High LDL, high total cholesterol, and high triglyceride levels were defined as having serum levels of ≥160 mg/dL, ≥200 mg/dL, and ≥150 mg/dL, respectively.

2.3. Analysis

Proportions for demographic characteristics were computed. One-way ANOVA analyses examined the mean differences in systolic blood pressure, diastolic blood pressure, total cholesterol, triglycerides, LDL, and HDL levels across community clinics. We also evaluated mean differences by community clinics, stratified by sex. Logistic regression models evaluated the independent associations between the age, sex and community clinic with systolic blood pressure, diastolic blood pressure, total cholesterol, triglycerides, LDL, and HDL levels, adjusting for type 2 diabetes, employment, marital status, and age category. Due to missing information, fifty-nine cases were excluded from logistic regression models. Our results are presented in terms of crude and adjusted odds ratios (ORs) and 95% confidence intervals. An alpha level was set a priori at 0.05. All analyses were performed using Stata, v. 12 [32].

2.4. Ethical Considerations

Upon admittance to each community clinic, each participant gave written informed consent to participate in the study, offered in English or Spanish. The institutional review board of The University of Texas at Tyler approved this study.

Table 1. Characteristics of Hispanics in Northeast Texas across community clinics

		Systolic Hypertension			Diastolic Hypertension		
	Overall, % n=477	Yes, % n=137	No, % n=310	p-value	Yes, % n=121	No, % n=326	p-value
Sex[a]							
Men	37.0%	45.9%	33.2%		45.3%	34.0%	
Women	63.0%	54.1%	66.8%	0.012	54.7%	66.0%	0.031
Clinic							
FQHC	20.8%	18.3%	21.9%		7.4%	25.8%	
CHC	40.3%	56.2%	33.2%		64.5%	31.3%	<0.001
FBO	38.9%	25.6%	44.8%	<0.001	28.1%	42.9%	
Age Category							
18-30	22.8%	21.9%	23.2%		24.0%	22.4%	
31-50	56.6%	46.7%	61.0%		57.0%	56.4%	
51+	20.6%	31.4%	15.8%	0.001	19.0%	21.2%	0.860
Martial Status[a]							
Single/Divorced/Widowed	35.1%	33.7%	35.7%		28.4%	62.9%	
Married	64.9%	66.4%	64.3%	0.713	71.6%	37.1%	0.133
Type 2 Diabetes Status[a]							
No	79.0%	19.0%	78.1%		90.0%	74.9%	
Yes	21.0%	81.0%	21.9%	0.486	10.0%	25.1%	0.001
Insurance							
None	88.8%	90.5%	88.1%		90.9%	88.0%	
Medicare/Medicaid	4.5%	2.9%	5.2%		3.3%	4.9%	
Other	6.7%	6.6%	6.7%	0.566	5.8%	7.1%	0.670
Employment Status							
Unemployed	36.9%	46.7%	32.6%		43.8%	34.4%	
Employed	63.1%	53.3%	67.4%	0.004	56.2%	65.6%	0.066
Birth Country[a]							
U.S.	9.3%	11.2%	8.4%		8.5%	9.7%	
Mexico	76.7%	64.5%	82.3%		65.1%	81.9%	
Central America	14.0%	24.3%	9.3%	<0.001	26.4%	8.4%	<0.001
Highest Level of Education[a]							
High school/GED	27.0%	29.8%	26.3%		73.5%	27.1%	
Did not complete high school	73.0%	70.2%	74.7%	0.628	26.5%	72.9%	0.935
Language Spoken at Home[a]							
Spanish	83.3%	85.1%	82.8%		87.1%	82.4%	
English	16.7%	14.9%	17.2%	0.634	12.9%	17.6%	0.374
HDL							
Low (<50 mg/dL for women; <40 mg/dL for men)	20.8%	20.3%	21.0%		17.1%	22.1%	
High (≥50 mg/dL for women; ≥40 mg/dL for men)	79.2%	79.7%	79.0%	0.874	82.9%	77.9%	0.254
LDL							
High (≥160 mg/dL)	67.3%	72.3%	65.2%		82.6%	61.7%	
Low (<160 mg/dL)	32.7%	27.7%	34.8%	0.140	17.4%	38.3%	<0.001
Triglycerides							
High (≥150 mg/dL)	25.3%	88.3%	78.7%		90.9%	78.2%	
Low (<150 mg/dL)	74.7%	11.7%	21.3%	0.015	9.1%	21.8%	0.002
Total Cholesterol							
High (≥200 mg/dL)	63.5%	70.8%	60.3%		75.2%	59.2%	
Low (<200 mg/dL)	36.5%	29.2%	39.7%	0.034	24.8%	40.8%	0.002
Systolic Hypertension							
Yes (≥140 mm Hg)	30.6%	-	-		85.1%	10.4%	
No (<140 mm Hg)	69.4%	-	-	-	14.9%	89.6%	<0.001
Diastolic Hypertension							
Yes (≥90 mm Hg)	27.1%	75.2%	5.8%		-	-	
No (<90 mm Hg)	72.9%	24.8%	94.2%	<0.001	-	-	-

3. Results

The proportion of participants with high systolic blood pressure, diastolic blood pressure and total cholesterol in our study (prevalence of 29%, 38%, and 60%, respectively) are consistent with previous studies evaluating health outcomes among a low income, unemployed, and/or uninsured Hispanic population. [8,33] A majority of the participants did not complete high school, were uninsured, were born in Mexico or Central America and indicated that Spanish is the primary language spoken within the home (Table 1). Furthermore, 37% of the participants reported current unemployment and 21% reported a type 2 diabetes diagnosis.

The proportion of participants with high systolic blood pressure, diastolic blood pressure and total cholesterol in our study (prevalence of 29%, 38%, and 60%, respectively) are consistent with previous studies evaluating health outcomes among a low income, unemployed, and/or uninsured Hispanic population. [8,33] A majority of the participants did not complete high school, were uninsured, were born in Mexico or Central America and indicated that Spanish is the primary language spoken within the home. Furthermore, 37% of the participants reported current unemployment and 21% reported a type 2 diabetes diagnosis.

We further stratified the proportions by systolic hypertension status and by diastolic hypertension status. Compared to participants without systolic hypertension, participants with systolic hypertension had a higher percentage of participants who were men, were among the oldest age category, attended the CHC clinic, were born in Central America, and were unemployed. As expected, a majority of participants with systolic hypertension also had diastolic blood pressure (75.2%), high triglyceride levels (88.3%), and high total cholesterol levels (70.8%). Compared to participants without diastolic hypertension, participants with diastolic hypertension had a higher percentage of participants who were men, were among the oldest age category, attended the CHC clinic, were born in Central America, and had type 2 diabetes. A majority of participants with diastolic hypertension also had systolic blood pressure (85.1%), high LDL levels (82.6%), high triglyceride levels (90.9%), and high total cholesterol levels (75.2%).

Significant differences in means were noted for systolic blood pressure, diastolic blood pressure, and HDL levels across the community clinics (Table 2). Participants from the FQHC had the highest mean systolic blood pressure levels. Compared to the FQHC, the participants from the CHC had higher mean diastolic blood pressure levels and lower mean HDL levels (p-values<0.05). After stratifying for sex, the mean differences across the community clinics remained. Among women, there were significant differences in means for diastolic blood pressure levels and HDL levels across the community clinics (p-value<0.05; results not presented). Among men, significant differences in means were noted for diastolic blood pressure and HDL levels across the community clinics (p-value<0.05; results not presented). In particular, the mean diastolic blood pressure levels were the highest among Hispanic men within the CHC (Mean 79.6; 95% CI 76.3-82.9), as compared to the FQHC (Mean 63.3; 95% CI 56.0-70.7). Similarly, the HDL levels were considerably lower among Hispanic men within the CHC (Mean 34.3; 95% CI 29.0-39.6) as compared to the FQHC (Mean 49.0; 95% CI 30.0-68.0).

Table 2. Mean differences of measures by community clinic

	Mean (95% CI)			
	CHC	FQHC	FBO	p-value
Systolic Blood Pressure	121.8 (119.1, 124.6)	126.5 (123.0, 130.1)	119.1 (116.4, 122.9)	0.004 .0035*
Diastolic Blood Pressure	77.20 (75.1, 79.3)	73.9 (71.6, 76.1)	73.6 (71.9, 75.4)	0.022 .0218*.
Total Cholesterol	184.9 (182.8, 195.1)	184.4 (175.6, 193.2)	186.1 (171.4, 200.7)	0.701 .7010
HDL	36.6 (33.7, 39.6)	47.2 (44.7, 49.7)	46.3 (43.1, 49.6)	<0.001
LDL	114.1 (103.9, 124.3)	107.6 (100.2, 114.9)	118.9 (103.5, 134.4)	0.278 .2776

Table 3 illustrates the associations between sex, age, and community clinic with systolic hypertension, diastolic hypertension, and low HDL. In general, men were more likely to experience poor health outcomes. Compared to women, men were about twice as likely to experience systolic hypertension (adjusted OR 1.85; 95% CI 1.14-3.02), diastolic hypertension (adjusted OR 1.67; 95% CI 1.01-2.76), and poor HDL control (adjusted OR 2.39;95% CI 1.25-4.59).

Table 3. Associations of sex, age and community clinic with systolic hypertension, diastolic hypertension and low HDL levels

	Systolic Hypertension		Diastolic Hypertension		Low HDL	
	Crude OR (95% CI)	AOR[a] (95% CI)	Crude OR (95% CI)	AOR (95% CI)	Crude OR (95% CI)	AOR (95% CI)
Sex						
Women	1.00 [Reference	1.00 [Reference]	1.00 [Reference]	1.00 [Reference]	1.00 [Reference]	1.00 [Reference]
Men	1.70 (1.12, 2.58)	1.85 (1.14, 3.02)	1.60 (1.04, 2.47)	1.67 (1.01, 2.76)	1.93 (1.10, 3.37)	2.64 (1.39, 5.01)
Clinic						
FQHC	1.00 [Reference]	1.00 [Reference]	1.00 [Reference]	1.00 [Reference]	1.00 [Reference]	1.00 [Reference]
CHC	2.03 (1.18, 3.51)	3.16 (0.94-10.64)	7.13 (3.37, 15.08)	13.57 (3.21, 57.39)	0.48 (0.25, 0.94)	1.82 (0.40, 8.32)
FBO	0.68 (0.39, 1.23)	1.57 (0.50, 5.00)	2.27 (1.04, 4.96)	5.54 (1.42, 21.60)	0.24 (0.11, 0.51)	0.89 (0.24, 3.39)
Age Category						
18-30	1.00 [Reference]	1.00 [Reference]	1.00 [Reference]	1.00 [Reference]	1.00 [Reference]	1.00 [Reference]
31-50	0.81 (0.49, 1.36)	1.11 (0.59, 2.10)	0.94 (0.56, 1.57)	1.40 (0.73, 2.67)	1.70 (0.75, 3.83)	1.72 (0.66, 4.56)
51+	2.11 (1.17, 3.82)	3.59 (1.72, 7.51)	0.84 (0.44, 1.58)	1.70 (0.74, 3.77)	2.66(1.09, 6.51)	1.89 (0.65, 5.52)

[a] ORs were adjusted for employment, marital status, type 2 diabetes, and age category (where applicable).

Compared to the participants within the 18-30 age group, participants within the 51+ age group were nearly four times more likely to experience systolic blood pressure compared with the 18-30 age group (95% CI 1.72-7.51). It was suggestive that participants within the oldest age group were more likely to experience diastolic

hypertension and low HDL, albeit these associations were not statistically significant. We found no evidence of an association between hypertension or dyslipidemia with the middle age group.

Participants from the CHC were more likely to experience poor health outcomes. Compared to the FQHC, participants from the CHC thirteen times as likely to experience diastolic hypertension (95% CI 3.21-57.39); it was suggestive the CHC participants were more likely to experience systolic hypertension (adjust OR 3.16; 95% CI 0.94-10.64). Participants from the FBO were five times as likely to experience diastolic hypertension (95% CI 1.42-21.60) but there was no association with systolic hypertension. We found no evidence of an association between community clinics and HDL levels. These results are in agreement with the ANOVA results.

We also evaluated the influence of sex, age and community clinic on dyslipidemias (high cholesterol, high LDL, and high triglycerides); none of these associations were statistically significant (results not presented).

4. Discussion

This study is among the first to report the associations between sex, age and community clinic with hypertension and dyslipidemias among Hispanics in Northeast Texas. We provide evidence of increased odds for systolic hypertension among Hispanic men (as compared to women), participants from the CHC that served seasonal/migrant workers (as compared to FQHC), and older participants (as compared to participants in the youngest age group).

In general, Hispanic men are more likely to experience hypertension and dyslipidemia than Hispanic women. Hispanic men are twiceas likely to experience systolic hypertension and dyslipidemia (low HDL) as compared with Hispanic women. Previous studies addressing similar hypotheses have revealed mixed results. Fisher-Hoch et al. [11] demonstrated no difference in health outcomes by sex where as Lui et al. [34] found that Hispanic women had a higher prevalence of isolated systolic hypertension than Hispanic men. Still, other studies have demonstrated that Hispanic men have a higher prevalence of isolated systolic hypertension than Hispanic women. [35,36] One explanation for the increased odds for systolic hypertension among men is the role of androgens, such as testosterone. Human and animal studies have demonstrated that androgens may alter blood pressure regulation. [37] It also possible that oxidative stress may be important in mediating hypertension. [38] Although oxidative stress could explain the dyslipidemia among Hispanic men, these mechanisms are not yet clear.

Our stratified results provide evidence of hypertension and dyslipidemia among Hispanic men from the CHC serving the seasonal/migrant workers. Consistent with our findings, a previous study has demonstrated similar health outcomes among Hispanics and U.S. born Mexican-Americans. [39] Among other factors mentioned previously, unmeasured dietary behaviors could explain the hypertension and dyslipidemia we observed. Doyle et al. [40] reported poor dietary behaviors among seasonal/migrant workers in Texas Hispanics. Similarly, Weigel et al. [33] reported that migrant/seasonal workers near the U.S.–Mexico border region were often unable to access or afford nutritional foods. As a result, Hispanic migrant/seasonal workers may be more susceptible to poor health outcomes than the general population. We suspect that CHC participants consume diets high in sodium and low in dietary fiber, which could lead to hypertension [41] and lower HDL levels [42].

As expected, there is a positive association between advancing age and hypertension. In particular, older participants are nearly four times as likely to experience systolic hypertension as compared to the younger participants. In support of our findings, a recent study noted that the prevalence of systolic hypertension (but not diastolic hypertension) was highest among older Hispanic adults. [34] Indeed, systolic hypertension is the predominant type of hypertension experienced among older adults. [43] Strong evidence exists to support the increasing prevalence of hypertension with age. The impact of advancing age on hypertension is well-documented and likely involves an increase in arterial stiffness and endothelial dysfunction [44].

Hispanic men and older Hispanics have a higher morbidity and mortality resulting from coronary heart disease, stroke and other chronic diseases, due to the stronger associations with systolic hypertension and dyslipidemia. Research has indicated that hypertension is closely associated with long-term cardiovascular risk among men (but not necessarily women). [45] In general, it is likely that Hispanics are less likely to undergo screening tests for chronic disease, [5] treat high blood pressure [6] or self-manage chronic disease; [7,8,9] we suspect that this is especially true for Hispanic men and older Hispanics. Therefore, it is likely that improved efforts to educate Hispanic men and/or older Hispanics could ameliorate the poor health outcomes observed in the present study.

It is important to consider the limitations of our study. In order to address selection bias, we utilized systematic randomization for two clinics, the FQHC and the CHC. For FBO, we were not able to randomize the sample and we acknowledge the potential for selection bias. Although we attempted to adjust for important confounders (type 2 diabetes, employment, martial status), it is possible that residual confounding could have biased our findings. For instance, due to the large proportion of participants with missing height and weight information, we were unable to adjust for body mass index (BMI). We recognize the potential for residual confounding, as BMI is strongly associated with sex, age, and socioeconomic status, [46] as well as chronic disease morbidity and mortality. [47] Similarly, information on other important lifestyle factors (e.g. diet, alcohol, smoking) were unavailable and which may have a role in hypertension and dyslipidemia. [41,42,48,49,50,51,52] There may be other unmeasured psychological variables, such as acculturation, that that could bias our results. A recent study found that the prevalence of hypertension differs by acculturation status among Hispanics in Texas [53].

Strengths of this study include the large sample of low-income, unemployed and/or uninsured U.S. Hispanics, the use of established cutoff levels for biomarkers, and sufficient statistical power (as evidenced by narrow confidence intervals). Furthermore, it is likely that our findings are generalizable to the larger Hispanic population, as our data were in close agreement of demographic factors

(education, birth country, insurance status) and health outcomes with a study evaluating a similar hypothesis among a low income, unemployed, or uninsured Hispanic population [8].

5. Perspectives

The poor health outcomes observed among the Hispanics in our study are not likely to improve following implementation of the Affordable Care Act without improved education and outreach. [29] Therefore, we propose that healthcare professionals develop health education campaigns that are culturally relevant and specifically targeted toward Hispanic men. Askim-Lovseth et al. [13] attend to health education among Hispanics on three levels: preventive disease campaigns, the health provider/client relationship, and perceptions of prescription medication usage. With respect to prevention campaigns, one tried-and-tested strategy is the effective use of *promotor as* (Spanish-speaking community healthcare workers). [54] Another useful strategy is to train Hispanic youth to educate family members, [13] which may be particularly helpful in educating older men within a family. As to the health provider/client relationship, better healthcare experience depends on both parties improving dialogue skills (assuming that a common language is spoken), [13] and increasing the availability of interpreters, with special emphasis on providers spending more time with men. [55] A qualitative study with Texas Hispanics found that men seemed more 'stilted' about their health during conversations with facilitators and with each other. [40] Sex differences in attitudes toward health could be explained by a strong sense of masculine pride (i.e. *machismo*) often observed among Hispanic men. Concerning prescription drug usage, there is a need to recognize the economic motivations within this community. Hispanics living near the U.S.-Mexico border often prefer purchasing prescription medication in Mexico with the perceived notion of securing a lower price; [13] however, they are likely unaware that many prescription drug medications are less expensive in the U.S. [56] We believe that culturally-relevant health campaigns within the Hispanic community could ameliorate the hypertension and dyslipidemia we observed among Hispanic men and older Hispanics.

Acknowledgement

We would like to thank Ms. Debora Bell, RN MSN C-APRN, Dr. John English, MD, and Dr. Craig Gunter, MD, for access to their records for this study.

Disclosures

The authors declare no conflicts of interest in this study.

List of Abbreviations

ANOVA	analysis of variance;
BMI	body mass index;
CHC	Commmunity Health Center;
CI	confidence interval;
FBO	Faith-Based Organization;
FQHC	Federally Qualified Health Center;
HDL	high density lipoprotein;
HMO	Health Maintenance Organization;
LDL	low density lipoprotein;
MSA	Metropolitan Statistical Area;
OR	odds ratio;
U.S.	United States.

References

[1] Roger VL, Go AS, Lloyd-Jones DM, Benjamin EJ, Berry JD, Borden WB, Bravata DM, Dai S, Ford ES, Fox CS *et al*: Heart disease and stroke statistics--2012 update: a report from the American Heart Association. *Circulation* 2012, 125(1):e2-e220.

[2] Lora CM, Daviglus ML, Kusek JW, Porter A, Ricardo AC, Go AS, Lash JP: Chronic kidney disease in United States Hispanics: a growing public health problem. *Ethnicity & Disease* 2009, 19(4):466-472.

[3] Cruz ML, Goran MI: The metabolic syndrome in children and adolescents. *Current Diabetes Reports* 2004, 4(1):53-62.

[4] Ogden CL, Carroll MD, Curtin LR, Lamb MM, Flegal KM: Prevalence of high body mass index in US children and adolescents, 2007-2008. *JAMA* 2010, 303(3):242-249.

[5] Prevalence of cholesterol screening and high blood cholesterol among adults--United States, 2005, 2007, and 2009. *MMWR*2012, 61:697-702.

[6] Vital signs: awareness and treatment of uncontrolled hypertension among adults--United States, 2003-2010. *MMWR* 2012, 61:703-709.

[7] Kirk JK, Bell RA, Bertoni AG, Arcury TA, Quandt SA, Goff DC, Jr., Narayan KM: Ethnic disparities: control of glycemia, blood pressure, and LDL cholesterol among US adults with type 2 diabetes. *The Annals of Pharmacotherapy* 2005, 39(9):1489-1501.

[8] Vijayaraghavan M, He G, Stoddard P, Schillinger D: Blood pressure control, hypertension, awareness, and treatment in adults with diabetes in the United States-Mexico border region. *Revista Panamericana de Salud Publica(Pan American Journal of Public Health)*2010, 28(3):164-173.

[9] Brown AF, Gerzoff RB, Karter AJ, Gregg E, Safford M, Waitzfelder B, Beckles GL, Brusuelas R, Mangione CM: Health behaviors and quality of care among Latinos with diabetes in managed care. *American Journal of Public Health* 2003, 93(10):1694-1698.

[10] Harris MI: Racial and ethnic differences in health care access and health outcomes for adults with type 2 diabetes. *Diabetes Care* 2001, 24(3):454-459.

[11] Fisher-Hoch SP, Vatcheva KP, Laing ST, Hossain MM, Rahbar MH, Hanis CL, Brown HS, 3rd, Rentfro AR, Reininger BM, McCormick JB: Missed opportunities for diagnosis and treatment of diabetes, hypertension, and hypercholesterolemia in a Mexican American population, Cameron County Hispanic Cohort, 2003-2008. *Preventing Chronic Disease* 2012, 9:110298.

[12] Richard P, Alexandre PK, Lara A, Akamigbo AB: Racial and ethnic disparities in the quality of diabetes care in a nationally representative sample. *Preventing Chronic Disease* 2011, 8(6):A142.

[13] Askim-Lovseth MK, Aldana A: Looking beyond "affordable" health care: cultural understanding and sensitivity-necessities in addressing the health care disparities of the U.S. Hispanic population. *Health marketing quarterly* 2010, 27(4):354-387.

[14] Betancourt JR, Green AR, Carrillo JE: The challenges of cross-cultural healthcare--diversity, ethics, and the medical encounter. *Bioethics Forum* 2000, 16(3):27-32.

[15] Zhang X, Beckles GL, Bullard KM, Gregg EW, Albright AL, Barker L, Zhang X, Ruiz-Holguin R, Cerqueira MT, Frontini M *et al*: Access to health care and undiagnosed diabetes along the United States-Mexico border. *Revista Panamericana de Salud Publica (Pan American Journal of Public Health)*2010, 28(3):182-189.

[16] Schillinger D, Grumbach K, Piette J, Wang F, Osmond D, Daher C, Palacios J, Sullivan GD, Bindman AB: Association of health literacy with diabetes outcomes. *JAMA*2002, 288(4):475-482.

[17] Heisler M, Smith DM, Hayward RA, Krein SL, Kerr EA: Racial disparities in diabetes care processes, outcomes, and treatment intensity. *Medical Care* 2003, 41(11):1221-1232.

[18] Fiscella K, Franks P, Doescher MP, Saver BG: Disparities in health care by race, ethnicity, and language among the insured: findings from a national sample. *Medical Care* 2002, 40(1):52-59.

[19] Warner DC: Health issues at the US-Mexican border. *JAMA* 1991, 265(2):242-247.

[20] Proser M, Shin P: The role of community health centers in responding to disparities in visual health. *Optometry (St Louis, Mo)* 2008, 79(10):564-575.

[21] Patient Protection and Affordable Care Act, P.L. 111-148. In.: U.S. Government Printing Office. ; 2010.

[22] Casey MM, Blewett LA, Call KT: Providing health care to Latino immigrants: community-based efforts in the rural midwest. *American Journal of Public Health* 2004, 94(10):1709-1711.

[23] Huang ES, Zhang Q, Brown SE, Drum ML, Meltzer DO, Chin MH: The cost-effectiveness of improving diabetes care in U.S. federally qualified community health centers. *Health Services Research* 2007, 42(6 Pt 1):2174-2193; discussion 2294-2323.

[24] Starfield B, Shi L: The medical home, access to care, and insurance: a review of evidence. *Pediatrics* 2004, 113(5 Suppl):1493-1498.

[25] Shi L, Starfield B, Xu J, Politzer R, Regan J: Primary care quality: community health center and health maintenance organization. *Southern Medical Journal* 2003, 96(8):787-795.

[26] Porterfield DS, Kinsinger L: Quality of care for uninsured patients with diabetes in a rural area. *Diabetes Care* 2002, 25(2):319-323.

[27] Politzer RM, Yoon J, Shi L, Hughes RG, Regan J, Gaston MH: Inequality in America: the contribution of health centers in reducing and eliminating disparities in access to care. *Medical Care Research and Review* 2001, 58(2):234-248.

[28] DeHaven MJ, Hunter IB, Wilder L, Walton JW, Berry J: Health programs in faith-based organizations: are they effective? *American Journal of Public Health* 2004, 94(6):1030-1036.

[29] Black N: Health Coverage for the Hispanic Population Today and Under the Affordable Care Act. In. Washington, D.C.: Kaiser Commission; 2013.

[30] National High Blood Pressure Education P. In: *The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure.* edn. Bethesda (MD): National Heart, Lung, and Blood Institute (US); 2004.

[31] Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III) final report. *Circulation* 2002, 106(25):3143-3421.

[32] Stata v.12 software. In. College Station, TX: Stata-Corp LP.

[33] Weigel MM, Armijos RX, Hall YP, Ramirez Y, Orozco R: The household food insecurity and health outcomes of U.S.-Mexico border migrant and seasonal farmworkers. *Journal of Immigrant and Minority Health* 2007, 9(3):157-169.

[34] Liu X, Duan FF: Prevalence of Isolated Systolic Hypertension in Mexican Americans and Other Hispanics. *American Journal of Hypertension Research* 2013, 1(1):6-12.

[35] Albertorio-Diaz JR, Notzon FC, Rodriguez-Lainz A: Diabetes hospitalization at the U.S.-Mexico border. *Preventing Chronic Disease* 2007, 4(2):A28.

[36] McClure HH, Martinez CR, Snodgrass JJ, Eddy JM, Jimenez RA, Isiordia LE, McDade TW: Discrimination-related stress, blood pressure and epstein-barr virus antibodies among latin american immigrants in Oregon, us. *Journal of Biosocial Science* 2010, 42(4):433-461.

[37] Reckelhoff JF: Gender differences in the regulation of blood pressure. *Hypertension* 2001, 37(5):1199-1208.

[38] Lopez-Ruiz A, Sartori-Valinotti J, Yanes LL, Iliescu R, Reckelhoff JF: Sex differences in control of blood pressure: role of oxidative stress in hypertension in females. *American Journal of Physiology Heart and Circulatory Physiology* 2008, 295(2):H466-474.

[39] Barquera S, Durazo-Arvizu RA, Luke A, Cao G, Cooper RS: Hypertension in Mexico and among Mexican Americans: prevalence and treatment patterns. *Journal of Human Hypertension* 2008, 22(9):617-626.

[40] Doyle E RR, Bates D, Cooper C: Using community-based participatory research to assess health needs among migrant and seasonal farmworkers. *American Journal of Health Education* 2006, 37(5):279-288.

[41] Sacks FM, Svetkey LP, Vollmer WM, Appel LJ, Bray GA, Harsha D, Obarzanek E, Conlin PR, Miller ER, 3rd, Simons-Morton DG *et al*: Effects on blood pressure of reduced dietary sodium and the Dietary Approaches to Stop Hypertension (DASH) diet. DASH-Sodium Collaborative Research Group. *The New England Journal of Medicine* 2001, 344(1):3-10.

[42] Yang Q, Liu T, Kuklina EV, Flanders WD, Hong Y, Gillespie C, Chang MH, Gwinn M, Dowling N, Khoury MJ *et al*: Sodium and potassium intake and mortality among US adults: prospective data from the Third National Health and Nutrition Examination Survey. *Archives of Internal Medicine* 2011, 171(13):1183-1191.

[43] Franklin SS, Jacobs MJ, Wong ND, L'Italien GJ, Lapuerta P: Predominance of isolated systolic hypertension among middle-aged and elderly US hypertensives: analysis based on National Health and Nutrition Examination Survey (NHANES) III. *Hypertension* 2001, 37(3):869-874.

[44] Wallace SM, Yasmin, McEniery CM, Maki-Petaja KM, Booth AD, Cockcroft JR, Wilkinson IB: Isolated systolic hypertension is characterized by increased aortic stiffness and endothelial dysfunction. *Hypertension* 2007, 50(1):228-233.

[45] Glynn RJ, L'Italien GJ, Sesso HD, Jackson EA, Buring JE: Development of predictive models for long-term cardiovascular risk associated with systolic and diastolic blood pressure. *Hypertension* 2002, 39(1):105-110.

[46] Wang Y, Beydoun MA: The obesity epidemic in the United States--gender, age, socioeconomic, racial/ethnic, and geographic characteristics: a systematic review and meta-regression analysis. *Epidemiologic Reviews* 2007, 29:6-28.

[47] Flegal KM, Graubard BI, Williamson DF, Gail MH: Cause-specific excess deaths associated with underweight, overweight, and obesity. *JAMA* 2007, 298(17):2028-2037.

[48] Beilin LJ, Puddey IB, Burke V: Alcohol and hypertension--kill or cure? *Journal of Human Hypertension* 1996, 10 Suppl 2:S1-5.

[49] Fuchs FD, Chambless LE, Whelton PK, Nieto FJ, Heiss G: Alcohol consumption and the incidence of hypertension: The Atherosclerosis Risk in Communities Study. *Hypertension* 2001, 37(5):1242-1250.

[50] Forman JP, Stampfer MJ, Curhan GC: Diet and lifestyle risk factors associated with incident hypertension in women. *JAMA* 2009, 302(4):401-411.

[51] Garrison RJ, Kannel WB, Feinleib M, Castelli WP, McNamara PM, Padgett SJ: Cigarette smoking and HDL cholesterol: the Framingham offspring study. *Atherosclerosis* 1978, 30(1):17-25.

[52] Stefanick ML, Mackey S, Sheehan M, Ellsworth N, Haskell WL, Wood PD: Effects of diet and exercise in men and postmenopausal women with low levels of HDL cholesterol and high levels of LDL cholesterol. *The New England Journal of Medicine* 1998, 339(1):12-20.

[53] Vaeth PA, Willett DL: Level of acculturation and hypertension among Dallas County Hispanics: findings from the Dallas Heart Study. *Annals of Epidemiology* 2005, 15(5):373-380.

[54] Williams DR, Kontos EZ, Viswanath K, Haas JS, Lathan CS, MacConaill LE, Chen J, Ayanian JZ: Integrating multiple social statuses in health disparities research: the case of lung cancer. *Health Services Research* 2012, 47(3 Pt 2):1255-1277.

[55] Homedes N, Ugalde A: Mexican pharmacies: benefits and risks for border residents in the United States of America and Mexico. *Revista Panamericana de Salud Publica (Pan American Journal of Public Health)*2013, 33(3):196-204.

[56] Valdez CR, Dvorscek MJ, Budge SL, Esmond S: Provider Perspectives about Latino Patients: Determinants of Care and Implications for Treatment. *The Counseling Psychologist* 2011, 39(4):497-526.