Clinical Depressive Symptoms and Diabetes in a Binational Border Population

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Background: **Depression affects more Hispanics with type 2 diabetes than other ethnic groups. This exploratory, binational study examined the prevalence and correlates of clinical depressive symptoms in Hispanics of Mexican origin with type 2 diabetes living on both sides of the Texas Mexico border.**

Methods: **Two binational samples, consisting of 172 adult patients of Mexican origin with type 2 diabetes in South Texas and 200 from the Northeastern region of Mexico, were compared. Logistic regression analyses were used to test personal and social correlates to clinical depressive symptoms.**

Results: **The rate of clinical depressive symptoms was similar in both South Texas and Northeastern Mexico patients (39% and 40.5%, respectively). Gender, education, emergency department visits, and burden of diabetes symptoms were predictors of clinical depressive symptoms in the South Texas sample. Among respondents in the Northeastern Mexico sample, the only statistically significant correlate to clinical depressive symptoms was the burden of diabetes symptoms.**

Conclusions: **Diabetes and depression must be addressed as priorities in diabetes initiatives at the US Mexico border region. Further research is warranted to examine the extent and impact of involving family practice physicians from both sides of the border in depression screenings among patients with type 2 diabetes. (J Am Board Fam Med 2008;21:223–233.)**

Depression in patients with type 2 diabetes is associated with increased mortality rates, poor glycemic control, increased diabetes complications, increased functional disability, poorer compliance with treatment recommendations, and higher medical costs.[1–4] A recent meta-analysis[5] indicates that major depression and elevated depression symptoms are present, respectively, in 11% and 31% of people with diabetes in the United States. Moreover, depression affects more Hispanics with type 2 diabetes than blacks and non-Hispanic whites with the same condition.[6–8]

Hispanics are the largest and fastest growing minority population in the United States[9] and are disproportionately affected by type 2 diabetes and its related complications and comorbidities.[10,11] The prevalence of diabetes in this minority group is 2 times higher when compared with whites.[11,12] Hispanics with type 2 diabetes are also 2 times more likely to develop diabetes-related complications than non-Hispanic whites.[13–16] The burden of diabetes in Hispanics is even more salient in the United States Mexico border area. Almost 16% of border residents suffer from type 2 diabetes, a higher rate than the national rates both in Mexico (7.5%) and the United States (13.9%).[17] Along the border, the diabetes death rate for Hispanics living in US counties (46.7 age-adjusted per 100,000 population) is 3 times the rate for non-Hispanic whites (16.3 age-adjusted per 100,000 population).[18] On the Mexican side of the border, the diabetes prev-

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alence rate is higher than the national rate in Mexico (8.4% and 7.5%, respectively).[19,20]

Although depression is 2 times more prevalent in diabetic patients than the general population,[2,5,21] the reasons for higher prevalence rates among diabetics are not fully understood. The cause of depression in patients with diabetes is difficult to identify because this condition may have biological roots, may be associated to the burden of complications, or a combination of both.[22] A biopsychosocial approach proposed by Fisher et al[23] suggests that multiple disease, personal, social, and community factors interact to affect depression in people with diabetes. Previous research about Hispanics with type 2 diabetes in the United Sates found that correlates to depression include age,[8] education,[8,23] financial stress,[23] poorer self-rated health,[24] diabetes-related functional impact,[23] understanding and knowledge of diabetes,[24] lifestyle behaviors,[25] and poor glycemic control.[26]

Research examining depression and diabetes in patients along the United States Mexico border is warranted. High diabetes prevalence rates and related comorbidities in the border region not only affect patients' quality of life but also result in high economic costs for both the US and Mexico health care systems and communities.[19,27] Although Healthy Border 2010 identifies diabetes and mental health issues as border priorities,[28] the prevalence of depression in diabetics in the border region is unknown. The purpose of this study was to determine the levels and correlates of clinical depressive symptoms in Hispanic adult patients of Mexican origin with type 2 diabetes residing on both sides of the Texas Mexico border.

Methods

This was a cross-sectional study based on a survey conducted in 2004 to 2005 with 2 samples in the Lower Rio Grande Valley in South Texas and Reynosa in the Northern Tamaulipas region of Mexico. Using a convenience sampling technique, this study recruited people with type 2 diabetes from clinical settings on both sides of the border (hospitals and physicians' offices). Inclusion criteria included age of 18 years or older; diagnosis of type 2 diabetes for at least 1 year; and willingness to give informed consent. A total of 199 patients in South Texas and 200 in Northern Tamaulipas agreed to participate in the study. The recruitment sites included hospitals and physicians' offices. Staff from these facilities identified potential participants and asked them if they would be interested in participating in this study. The research team contacted these potential participants. In the case of the South Texas sample, participants were interviewed at a location of their convenience, usually at the physician's office or Texas A&M headquarters. Participants in Northern Tamaulipas were interviewed at the hospital. In the analysis we only included participants of Mexican origin with complete data, resulting in a sample size of 172 from South Texas and 200 from Northern Tamaulipas. This study was approved by the Texas A&M University Institutional Review Board.

Measures

Depressive symptoms were assessed using the Center for Epidemiologic Studies Depression Scale. This scale is a 20-item self-report depression inventory with possible scores ranging from 0 to 60. Reliability and validity of the scale have been tested in general and clinical populations, yielding very good internal consistency, with an α of 0.85 for the general population and 0.90 for a patient population. Scale scores range from 0 to 60. A cutoff point of 16 and above indicates clinically significant levels of depressive symptoms.[29] Although the scale does not provide a diagnosis of clinical depression, it has been shown to predict both current and future clinical depression.[30] The Center for Epidemiologic Studies Depression Scale has been validated in patients with diabetes,[31] and the Spanish version has high validity and reliability (Cronbach's α, 0.90).[32,33]

Independent variables included demographic characteristics, health factors, health care use factors, and level of family support. Demographic variables included gender; age; marital status; country of origin (Mexico or United States, only applied to the South Texas sample); education level; socioeconomic status; and acculturation (only applied to the South Texas sample). Socioeconomic status was assessed by asking participants if they were employed or not; employment is an indicator of socioeconomic position.[34,35] Household income was not included because of missing values. Acculturation was measured using the Short Acculturation Scale for Hispanics, a 12-item scale that has been validated in Spanish and has an internal reliability of $\alpha = 0.92$.[36] Health factors were measured from

self-report information and included the following: self-rated health status; age when diagnosed with diabetes; duration of diabetes; high blood pressure, heart disease, high cholesterol, insulin use, amputations, smoking, vision problems related to reading, driving, and watching TV; sexual function problems; leg discomfort limiting activities around the house, wearing wanted shoes, and sleeping; limited social life because of the need to follow a special diet; hypoglycemic symptoms; diabetes symptoms; patient's beliefs (including "sugar monitoring is painful," "taking medication or insulin is a waste of time," and "blood glucose level testing is difficult"). Body mass index was not included in the analyses because of missing values.

The burden of diabetes symptoms variable was measured using the Patient's Questionnaire Diabetes Form 2.1.[37] This variable was calculated by summing 15 diabetes symptoms (from 0 to 15).

Use of health care factors included number of emergency department visits, doctor visits, hospital stays, diet counseling sessions, and diabetes education sessions during the past 12 months. Glucose level check was assessed asking the question, How many times do you check your blood sugar in an average week? (daily versus not daily).

Family support was measured using the Family Behavior Checklist, which assesses actions of a relative identified by the participant as the supportive person in their efforts to manage their diabetes. Scale items include the relative's supportive behaviors related to medication, glucose testing, exercise, diet, and in general. A positive summary score (high vs low family support) was obtained by averaging the frequency ratings over all 5 supportive items. Reliability and predictive validity of this scale is between 0.64 and 0.84. The scale also asks the participant to rate the diabetes-related knowledge level of the supportive relative (low versus moderate versus high).[38] The scale was translated into Spanish using a back-translation technique.

Data Analyses

Summary statistics were calculated to describe each sample in terms of sociodemographic and health-related variables. Demographic characteristics and health indicators between samples were compared using the Mann-Whitney *U* test. Logistic regression analyses (unadjusted univariate and adjusted multivariate logistic regression) were used to test the association between the dependent variable (clinical depressive symptoms) and independent variables. The self-rated health status variable was not included in the logistic regression analyses because it was highly correlated with diabetes symptoms ($P < .01$) in both samples. Including the self-rated health status variable in the multivariate regression may have distorted the results because of the colinearity problem in the regression fitting. Values of odds ratios, 95% CI, and *P* were reported in the logistic regression analyses. The Hosmer-Lemeshow goodness-of-fit test was conducted to test model fit. $P < .05$ was considered significant for all statistical tests conducted. The analyses were performed using the computer program SPSS version 13.0 for Windows (SPSS, Inc., Chicago, IL).[39]

Results

Table 1 shows the distribution of demographic characteristics and health measures for both samples and between-group differences. The majority of participants on both sides of the border were women, married, and had a low socioeconomic status. Almost half of the respondents in South Texas (47.7%) were born in Mexico and the majority (79%) had low levels of acculturation. Respondents in South Texas had a mean age of 57.8 (SD, 14.1) and the Northern Tamaulipas participants of 55.8 (SD, 12.2). Significantly more Northern Tamaulipas respondents were women and had less than a high school education than the South Texas participants.

The overall rate of clinical depressive symptoms was similar for both South Texas and Northern Tamaulipas patients (39% and 40.5%, respectively). There were no significant differences in clinical depressive symptoms between the samples. The majority of patients on both sides of the border reported having hypertension and high cholesterol. The majority in both samples also reported to perceive a high level of family support. Although the main source of family support for the South Texas participants was the spouse, for patients in Northern Tamaulipas it was both their spouse and children.

Compared with respondents in Northern Tamaulipas, significantly more South Texas participants reported better self-rate health status, but they also reported having high cholesterol. Conversely, significantly more patients in Northern Tamaulipas reported fewer physician visits in the past 12 months than did their South Texas counterparts.

Table 1. Comparison of Demographic and Health Characteristics Between South Texas and Northern Tamaulipas Samples

	South Texas (n = 172)[†] (n [%][‡])	Northern Tamaulipas (n = 200)[†] (n [%][‡])	*P*
Demographic characteristics			
Gender*			.022
Female	113 (65.7)	153 (76.5)	
Male	59 (34.3)	47 (23.5)	
Marital status			.574
Married	110 (64.0)	121 (61.1)	
Not married	62 (36.0)	77 (38.9)	
Country of origin			.000
Mexico	82 (47.7)	200 (100)	
United States	90 (52.3)	0 (0)	
Education*			.007
<High school	98 (57.0)	140 (70.4)	
≥High school	74 (43.0)	59 (29.6)	
Socioeconomic status			.245
Low	127 (74.7)	158 (79.8)	
High	43 (25.3)	40 (20.2)	
Acculturation			na
Low	137 (79.3)	na	
High	35 (20.3)	na	
Health factors			
CES_D scores[§]			.762
<16	105 (61)	119 (59.5)	
≥16	67 (39)	81 (40.5)	
Self-rated health status*			.000
Poor/Very poor	25 (14.6)	57 (28.6)	
Fair	49 (28.7)	87 (43.7)	
Good	69 (40.4)	35 (17.6)	
Excellent/Very good	28 (16.4)	20 (10.1)	
Hypertension			.310
Yes	112 (65.1)	120 (60.0)	
No	60 (34.9)	80 (40.0)	
Heart Disease		(0.053)	
Yes	55 (32.0)	46 (23.0)	
No	117 (68.0)	154 (77.0)	
High Cholesterol*			.000
Yes	107 (63.7)	79 (39.7)	
No	61 (36.3)	120 (50.3)	
Amputations			
Yes	10 (5.8)	8 (4.0)	
No	162 (94.2)	191 (96.0)	
Smoking			.207
Yes	13 (7.6)	23 (11.5)	
No	158 (92.4)	177 (88.5)	
Healthcare use			.273
Emergency room visits (past 12 months)			
≥1 times	51 (29.7)	70 (35.0)	
0	121 (70.3)	130 (65.0)	
Doctor visits* (past 12 months)			.000
≥Once a month	87 (50.6)	44 (22.2)	
<Once a month	85 (49.4)	154 (77.8)	
Hospital stays (past 12 months)			.625
≥1	51 (29.7)	64 (68.0)	
0	121 (70.3)	136 (32.0)	

*Significant difference between 2 groups using the Mann-Whitney *U* test.
[†]Because of missing data, the total number of individuals for each variable may be less than the total sample size.
[‡]Valid percent.
[§]Center for Epidemiological Studies Depression Scale. Scale scores range from 0 to 60, and a cut-off point of 16 and above indicates clinical depressive symptoms.
na, not applicable.

Table 2. Comparison of Diabetes-Related Characteristics Between South Texas and Northern Tamaulipas Samples

Characteristic	South Texas (n = 172)† (n [%]‡)	Northern Tamaulipas (n = 200)† (n [%]‡)	*P*
Duration of Diabetes (mean[SD])	11.0 (10.1)	10.1 (9.9)	.990
≥10 years	75 (44.4)	88 (44.4)	
<10 years	94 (55.6)	110 (55.6)	
Use of Insulin*			.000
Yes	93 (54.1)	40 (20.0)	
No	79 (45.9)	160 (80.0)	
Frequency of glucose monitoring*			.000
Daily	130 (75.6)	8 (4.1)	
Not Daily	42 (24.4)	189 (95.9)	
Diet counseling sessions* (past 12 mo)			.000
≥2	38 (22.1)	80 (40.0)	
1	27 (15.7)	42 (21.0)	
0	107 (62.2)	78 (39.0)	
Diabetes education sessions (past 12 mo)			.274
≥2	24 (14.0)	29 (14.5)	
1	25 (14.5)	16 (8.0)	
0	123 (71.5)	155 (77.5)	
Vision problems affecting:			
Reading			.071
Yes	93 (54.1)	126 (63.3)	
No	79 (45.9)	73 (36.7)	
Driving			.294
Yes	22 (12.9)	28 (15.7)	
No	149 (87.1)	150 (84.3)	
Watching television			.007
Yes	51 (29.7)	86 (43.2)	
No	121 (70.3)	113 (56.8)	
Problems with sexual function			.347
Yes	54 (32.3)	49 (27.7)	
No	113 (67.7)	128 (72.3)	
Leg discomfort interferes with:			
Home activities			.791
Yes	88 (51.2)	98 (49.5)	
No	84 (48.8)	100 (50.5)	
Wearing preferred shoes			.174
Yes	66 (38.4)	88 (44.7)	
No	106 (61.6)	109 (55.3)	
Sleep			.259
Yes	55 (32.0)	74 (37.2)	
No	117 (68.0)	125 (62.8)	
Special diet affects social life			.328
Yes	57 (33.1)	56 (28.4)	
No	115 (66.9)	141 (71.6)	
Diabetes Symptoms* (mean[SD])	6.36 (3.52)	6.91 (3.18)	.000
Low sugar reaction (past 4 wk)			.063
Yes	84 (48.8)	76 (38.6)	
No	88 (51.2)	121 (61.4)	
"Glucose monitoring is painful"*			.022
Agree	73 (43.2)	63 (31.7)	
Disagree	96 (56.8)	136 (68.3)	
"Taking medication or insulin is a waste of time"			.689
Agree	14 (8.7)	15 (7.5)	
Disagree	147 (91.6)	184 (92.5)	
"Testing blood glucose is difficult"*			.038
Agree	43 (25.6)	32 (16.7)	
Disagree	125 (74.4)	160 (83.3)	

*Significant difference between two groups using the Mann-Whitney U test.
†Due to missing data, the total number of individuals for each variable may be less than the total sample size.
‡Valid percent.

Table 2 shows the distribution of diabetes-related characteristics for both samples and between-group differences. The majority of patients on both sides of the border reported being diagnosed with diabetes for less than 10 years and had not received any diabetes education during the past 12 months. Significantly more South Texas than Northern Tamaulipas respondents used insulin and believed that testing glucose level was painful and difficult. Conversely, significantly more patients in Northern Tamaulipas reported less frequent glucose level checks and a higher number of diabetes-related symptoms than their South Texas counterparts. There was also a significant difference between groups in relation to diet counseling, with more Northern Tamaulipas respondents than South Texas patients receiving 2 or more diet sessions during the past 12 months.

Table 3 shows the univariate (unadjusted) logistic regression analyses for each sample. Only variables that were statistically significant are listed in the table. Analyzed singly, the following variables had a statistically significant association with depression in both the South Texas and Northern Tamaulipas samples: gender; emergency department visits; hospital stays; diabetes symptoms (including leg discomfort interfering with sleep, home activities, and wearing preferred shoes); and limited social life because of having a special diet. Among South Texas participants, education level, high cholesterol, visits to the doctor more than once a month, vision problems that interfere with television watching, perception that glucose testing was difficult, and family support also had a statistically significant association with clinical depressive symptoms. Among Northern Tamaulipas participants gender; socioeconomic level; heart disease; vision problems that interfere with reading, driving, and watching television; and perception that glucose testing was difficult were statistically significantly correlated to clinical depressive symptoms.

Table 4 presents the results from the multivariate (adjusted) logistic regression analyses. Only significant associations are presented by sample. Among South Texas respondents, female gender, a low level of education, one or more emergency department visits during the past 12 months, burden of diabetes symptoms, having leg discomfort that interferes with wearing preferred shoes, and the perception that glucose testing was difficult were significantly correlated to clinical depressive symptoms. However, those reporting high cholesterol were less likely to have clinical depressive symptoms.

Among respondents in the Northern Tamaulipas sample the 2 items significantly associated with clinical depressive symptoms in the multivariate logistic model were the burden of diabetes symptoms and leg discomfort interfering with home activities. The estimated odds of having clinical depressive symptoms increased for each additional diabetes symptom by 27% for South Texas participants and 36% for the Northern Tamaulipas respondents.

Discussion

Our findings indicate that the prevalence of clinical depressive symptoms in both South Texas and Northern Mexico border residents with type 2 diabetes (39% and 40.5%, respectively) is higher than what is reported in the literature of clinical diabetic samples in the United States (32%).[5]

Specifically, the prevalence rate of clinical depressive symptoms among South Texas respondents in our study was also higher than those reported in studies conducted with older Mexican Americans in Southwestern states (25.6% to 31.1%)[40,41] or Hispanic adult patients (31.6%),[6,23] but similar to a study with Hispanic women in South Florida (40.6%).[24] In the case of our border sample from the Mexican side, the clinical depressive symptoms prevalence rate found was similar to previous studies conducted in Central Mexico (37.91% to 39%)[25,42] but inconsistent with another study from Mexico City (46%).[43]

Our study found that the strongest predictor of clinical depressive symptoms in type 2 diabetes patients on both sides of the Texas Mexico border was the burden of diabetes symptoms. Among respondents in Mexico this was the only predictor of depression. Our findings are in line with previous research in the United States.[44–47] Our study, however, did not establish causation. Further research is needed to identify a causal pathway to determine how depression and the burden of diabetes symptoms interact. In addition, future research should investigate if identifying and treating depression in diabetic patients may result in a decreased burden of diabetes symptoms.

Additional significant correlates to clinical depressive symptoms in the South Texas sample were

Table 3. Univariate Correlates to Clinical Depressive Symptoms by Two Study Samples

	South Texas			Northern Tamaulipas	
Significant Correlates*	OR (95% CI)	*P*	Significant Correlates*	OR (95% CI)	*P*
Demographic factors			Demographic factors		
Gender			Gender		
Female	2.50 (1.25–5.00)	.010	Female	2.76 (1.61–5.82)	.008
Male	1.00		Male	1.0 (0)	
Education			Education		
<High school	2.23 (1.17–4.24)	.014	<High school	2.39 (1.09–5.21)	.029
≥High school	1.00		≥High school	1.00	
Health factors			Health factors		
High cholesterol			High cholesterol		
Yes	0.39 (0.20–0.74)	.004	Yes	2.08 (1.07–4.06)	.031
No	1.00		No	1.00	
Burden of diabetes symptoms	1.40 (1.24–1.57)	.000	Burden of diabetes symptoms	1.45 (1.27–1.64)	.000
Vision problems affect:			Vision problems affect:		
Television watching			Television watching		
Yes	2.56 (1.61–5.00)	.006	Yes	2.56 (1.43–4.59)	.002
No	1.00		No	1.00	
″Testing blood glucose is difficult″			Reading		
Agree	3.25 (1.59–6.66)	.001	Yes	2.04 (1.11–3.76)	.022
Disagree	1.00		No	1.00	
Diet limits social life	3.28 (1.69–6.34)	.000	Driving		
Yes	1.00		Yes	2.67 (1.17–6.11)	.020
No			No	1.00	
Leg discomfort affects:			Leg discomfort affects:		
Home activities			Home activities		
Yes	5.74 (2.88–11.46)	.000	Yes	5.69 (3.04–10.67)	.000
No	1.00		No	1.00	
Wearing preferred shoes			Wearing preferred shoes		
Yes	6.09 (3.07–12.07)	.000	Yes	(1.41–4.53)	.002
No	1.00		No		
Sleep			Sleep		
Yes	4.00 (2.03–7.89)	.000	Yes	3.18 (1.75–5.78)	.000
No	1.00		No	1.00	
			Diet limits social life		
			Yes	3.19 (1.68–6.06)	.000
			No	1.00	
			″Glucose monitoring is painful″		
			Yes		
			No	3.29 (1.77–6.12)	.000
				1.00	
Healthcare use factors			Healthcare use factors		
Number of ER visits			Number of ER visits	2.00 (1.11–3.62)	.022
≥1	2.28 (1.17–4.44)	.016	≥1	1.00	
0	1.00		0		
Hospital stays			Hospital stays		
≥1	2.03 (1.04–3.95)	.037	≥1	2.60 (1.41–4.78)	.002
0	1.00		0	1.00	
Number of doctor visits	2.76 (1.46–5.21)	.002			
≥1 per month	1.00				
<1 per month					
Social factors					
Family support	0.50 (0.26–0.94)	.032			
Low	1.00				
High					

*Only variables that were significant individually were included into the logistic regression model.; $P < .05$.
CI, confidence interval; OR, odds ratio.

Table 4. Multivariate Correlates to Clinical Depressive Symptoms by Two Study Samples

	South Texas			Northern Tamaulipas	
Significant Correlates*	OR (95% CI)	*P*	Significant Correlates*	OR (95% CI)	*P*
Demographic factors			Health factors		
Gender			Leg discomfort interferes with home activities		
Female	3.51 (1.19–10.40)	.023	Yes	3.82 (1.60–9.11)	.003
Male	1.00		No	1.00	
Education			Diabetes symptoms	1.66 (1.16–1.59)	.000
<High school	4.16 (1.55–11.16)	.005			
≥High school	1.00				
Health factors					
High Cholesterol					
Yes	0.37 (0.15–0.92)	.032			
No	1.00				
Diabetes symptoms	1.27 (1.08–1.50)	.004			
Leg discomfort interferes with wearing preferred shoes					
Yes	3.21 (1.11–9.24)	.031			
No	1.00				
"Testing blood glucose is difficult"					
Agree	3.14 (1.14–8.66)	.027			
Disagree	1.00				
Healthcare utilization factors					
Number of ER visits					
≥1	3.37 (1.02–11.12)	.046			
0	1.00				

*Only variables that were significant individually were included into the logistic regression model.; $P < .05$.
CI, confidence interval; OR, odds ratio.
Note: the Nagelkerke R^2 was 0.527 for the model of the US sample and 0.514 for the model of the Mexico sample. These values indicate that a substantial portion (over 50%) of variation of the depression variable is explained away by the fitted models for both populations. The Hosmer-Lemeshow goodness-of-fit tests for both models were not significant ($P = 0.567$ for the US model; $P = 0.975$ for the Mexico model), which suggest adequate model fitting to the data.

female gender and low levels of education, which is consistent with previous studies.[8,23,42,43,48–50] Research suggests that low access to education affects health literacy and English proficiency in Hispanic patients with type 2, leading to distress and poorer diabetes self-care.[8,51]

Emergency department visits were also associated with higher levels of depressive symptoms in US respondents. The finding agrees with previous research[52–54] and underlines the importance of recognizing depression as a risk factor for increasing health care expenditures.

Our study shows that the South Texas respondents who perceived that blood glucose testing was difficult were more likely to report clinical depressive symptoms, which is consistent with previous research.[55] Diabetes interventions in the border region focusing on self-efficacy and the improvement of skills in self-monitoring of blood glucose may result in positive diabetes-related outcomes.[56–58]

An intriguing finding in our study was that the South Texas participants who reported having high cholesterol were less likely to have clinical depressive symptoms. Although this study did not examine medication intake by respondents, it is possible that this finding might be related to the type of cholesterol medications taken by South Texas patients. Research studying the association between statins therapy and depression is still controversial,[59–61] but some studies indicate that cholesterol-lowering drugs are associated with a reduced risk of depression.[62,63] Further research is warranted to better understand the effects of statins-based med-

ications on depression among diabetic patients in both the US and Mexican health care systems. Additional research should also investigate if hyperlipidemia should be considered an early marker of depression.

This exploratory study has several limitations. The convenience sample of diagnosed patients with type 2 diabetes limits generalizations and thereby causal inferences cannot be made. In addition, both dependent and independent variables were measured using a self-report instrument, which carries possible intrinsic respondent biases and measurement errors. Another limitation is that this study did not explore if participants were taking antidepressants, which may have introduced respondent biases.

Despite its limitations, this preliminary study makes a significant contribution to the literature by assessing the prevalence and correlates of clinical depressive symptoms in Hispanic patients with type 2 diabetes living on both sides of the Texas Mexico border. To the best of our knowledge this is the first binational study addressing depression and diabetes among border residents. Our findings may have health policy implications. Healthy Border 2010 identifies diabetes and mental health issues as border health priorities. Screening diabetics for depression is of great importance because there is evidence that treatment of depression improves glycemic control[64] and increases a patient's quality of life.[65] Healthy Border 2010, however, recognizes that access to mental health services along the US Mexico border is problematic because of a shortage of specialty mental health providers and services.[28] In addition, differences between both the US and the Mexican health care systems and practices pose barriers to meaningful cooperative health programs that, if successful, could contribute to the health improvement of the border population.[66] Further research is warranted to examine the feasibility and impact of binational programs involving family practice physicians on both sides of the border in depression screenings among patients with type 2 diabetes.

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