Journal of Depression and Anxiety
ISSN: 2167-1044

Mauer et al. J Depress Anxiety 2011, 1:1
DOI: 10.4172/2167-1044.1000107

Research Article Open Access

# Diabetes Diagnosis is related to Anxiety Among Mexican Americans But Not non-Hispanic Adults: A Project FRONTER study

**Cortney B. Mauer[1], Leigh A. Johnson[2,3], Gregory W. Schrimsher[4] and Sid E. O'Bryant[2,3]***

[1]*Department of Psychology, Texas Tech University, Lubbock, TX*
[2]*F. Marie Hall Institute for Rural & Community Health, Texas Tech Health Sciences Center, Lubbock, TX, USA*
[3]*Department of Internal Medicine & Institute for Aging and Alzheimer's Disease Research, University of North Texas Health Science Center, Fort Worth, TX, USA*
[4]*Department of Psychiatry, Texas Tech University Health Sciences Center, Lubbock, TX, USA*

## Abstract

This study examined the link between diabetes and specific anxiety symptoms among Mexican Americans in comparison with non-Hispanics in a rural sample. The prevalence of Hispanic, and more specifically, Mexican American individuals with diabetes, is larger than their white, non-Hispanic counterparts. Adults with diabetes also experience psychological dysfunction, particularly an elevation in anxiety symptoms. Both non-Hispanic and Hispanic individuals have been found to experience co-occurring anxiety disorders and diabetes. Hispanic individuals have a higher prevalence of both anxiety and diabetes than non-Hispanic individuals. Cross-sectional data were analyzed from 582 rural dwelling individuals from an ongoing rural health study, Project FRONTIER. The Beck Anxiety Inventory (BAI) and the factor scores previously derived by the test's authors (i.e., Subjective, Neurophysiological, Autonomic, and Panic) were entered as predictor variables into regression models with Diabetes diagnosis as the outcome variable. Among Mexican Americans, diabetes diagnosis was significantly related to BAI total score. The diagnoses were significantly related to all of the BAI factor scores. Specifically, Panic, Autonomic, Neurophysiological, and Subjective factor scores. Diabetes diagnosis was not related to BAI total or factor scores among non-Hispanics. Research and clinical implications are discussed.

**Keywords:** Anxiety; Diabetes; Mexican American

Diabetes has become one of the fastest growing health issues in the United States, with roughly 23.6 million people living with the disease [1]. The Hispanic population has experienced a large increase in the incidence of diabetes. In fact, the prevalence of diabetes in Hispanic adults is 1.7 times greater than among white, non-Hispanic individuals [2]. Mexican Americans are twice as likely to be diagnosed with diabetes than non-Hispanic white individuals [3]. Although the Hispanic population altogether is at a higher risk for diabetes compared to other ethnic groups, some subgroups, for instance Mexican Americans, are at an even higher risk for diabetes. A study by Smith and Barnett used data from the National Vital Statistics System and the 1990 and 2000 censuses and examined age-adjusted and age-specific diabetes-related death rates for Mexican Americans who were 35 years and older [4]. When compared to other Hispanic subgroups, Mexican Americans were at the highest risk for diabetes-related mortality (251 deaths per 100,000) [4].

There also is a relationship between Hispanic adults with type 2 Diabetes and poorer glycemic control [5]. Hispanic individuals experience more complications related to their diabetes and difficulty with self-management compared to their Caucasian adult counterparts [5-6]. Disparities in the experiences of Hispanics and Caucasians result in variances in the respective groups' access to health-care services, as well as their utilization of these services. For instance, Hispanic populations experience higher hospitalization rates due to diabetes, as well as a greater number of end-stage renal failures due to the disease [7]. Approximately twenty percent of Hispanics will not look for medical help because of difficulty understanding English [7]. In addition, Hispanics do not have equivalent access to receiving medical treatment in comparison to Caucasians. That is, they tend to receive poorer quality of care than Caucasians when they are being treated for the same medical condition [7,8]. Smith and Barnett found that Mexican American diabetics maintained low levels of education attainment and poor incomes compared to Cuban Americans [4]. Thus, Mexican Americans may be affected by factors including poverty, income, education, and migration and therefore contributing to the ethnic health disparities [9]. Therefore, understanding health conditions among Hispanics, and particularly Mexican Americans, is critical.

In addition to the differential treatment received by Hispanic individuals, there are also problems related to access to care if living in rural areas. Specifically, there are fewer physicians in such areas, and chronic conditions such as diabetes are more prevalent [10]. Individuals residing in rural communities are also at risk for psychological disorders diagnoses [11]. Therefore, it is important for practitioners in rural communities to be aware of the comorbidities between medical and psychological conditions to better serve their patients.

Adults with type 2 diabetes are more likely to receive psychological diagnoses [12]. Further, individuals who experience psychological distress and diabetes have poorer health and experience difficulty accessing health care [12,13]. Diabetics are twice as likely to experience symptoms of anxiety and depression than the general population [12,14]. In fact, 40% of diabetics exhibit elevation in anxiety symptoms, and approximately 14% meet criteria for Generalized Anxiety Disorder,

***Corresponding author:** Sid E. O'Bryant, Department of Internal Medicine, University of North Texas Health Science Center, 3500 Camp Bowie Blvd, Fort Worth, Texas, 76107, USA; Tel: 817-735-2639; Fax: 817-735-2747; E-mail: sid.obryant@unthsc.edu

**Received** December 08, 2011; **Accepted** January 02, 2012; **Published** January 05, 2012

**Citation:** Mauer CB, Johnson LA, Schrimsher GW, O'Bryant SE (2011) Diabetes Diagnosis is related to Anxiety Among Mexican Americans But Not non-Hispanic Adults: A Project FRONTER study. J Depress Anxiety 1:107. doi:10.4172/2167-1044.1000107

which may be in part due to the overlapping symptomatology [15]. Engum examined whether depression and anxiety precede the onset of diabetes or vice versa [16]. The results of the study showed that diabetes were not predictive of depression and anxiety; however, depression and anxiety symptoms were significant risk factors for type 2 diabetes independent of other risk factors (i.e., SES, lifestyle). Treatment of anxiety symptoms is also related to better glycemic control further supporting the need to better understand the complex interactions of these conditions [17].

The high prevalence rates of anxiety disorders and diabetes among Hispanic populations makes these important conditions for research in order to improve healthcare of this oft-neglected segment of the population. Examining patients diagnosed with diabetes from a range of ethnic backgrounds, with and without psychiatric disorder diagnoses, Cabassa et al. found that Hispanic individuals experienced higher rates of anxiety disorders and diabetes in the past year compared to non-Hispanics [18]. The association between specific anxiety symptoms and diabetes among Mexican Americans, however, has not been examined to date. Therefore, the goal of this study was to examine the relation between diabetes and specific anxiety symptoms among Mexican Americans in comparison with non-Hispanics among a community-dwelling rural sample.

## Methods

### Participants

Participants were recruited from Project FRONTIER (Facing Rural Obstacles to healthcare Now through Intervention, Education, and Research), an ongoing epidemiological study of health among rural-dwelling adults and elders. Participant recruitment was conducted by community recruiters through brochures/flyers, presentations and events, as well as in-person and/or door-to-door solicitations. Door-to-door solicitations have proven to be the most successful means of participant recruitment by far. This study used a community-based participatory research (CBPR) approach and our overall cohort closely matches that of the eligible community [19]. Inclusion criteria are (1) age 40 and above and (2) residing in one of the counties part of Project FRONTIER. There were no exclusion criteria for this study. This project was designed to study a broad range of health issues facing rural adults and elders, including diabetes.

### Methods

Project FRONTIER is conducted under an IRB approved protocol, and all participants signed written informed consent. All interviews were conducted in either the participants' homes or at the local hospital in the participant's preferred language (English or Spanish). After completing the informed consent process, participants were scheduled for (1) a standardized medical examination to be completed by community clinicians (physicians, nurse practitioners, or physician assistants), (2) overnight fasting blood work at the local hospital laboratory, which included HbA1c levels, (3) a detailed interview including demographic information, medical history (self and family), medication usage (prescription and over the counter) and the Beck Anxiety Inventory (BAI; Beck and Steer, 1993) [20]. All participants received (1) detailed feedback from their examination as well as (2) payment for his/her time. This entire process was completed over multiple sessions within a two-week period.

### Measures

All Project FRONTIER data was reviewed at a weekly consensus review made up of physicians, psychologists, and project coordinators. Physicians included a board certified internist as well as a psychiatrist; psychologists included a clinical psychologist with expertise in substance abuse and a neuropsychologist. All diagnoses were assigned according to current guidelines by the relevant experts. Diagnoses of diabetes were assigned according to the 2010 revised criteria of the American Diabetes Association. All participants received feedback letters indicating the possibility of a range of medical conditions. A detailed feedback letter was also provided to the medical provider of the participant's choice outlining all issues raised by the review committee. A diagnosis of diabetes was not considered as part of the study entry. Some participants entered into the study with a diagnosis of diabetes while others were diagnosed by the consensus review committee. Glycated hemoglobin (HbA1c) a biological marker of glycemia measured over a 6 to 8 week period [21] was included in the diagnosis. Fasting blood was collected in the morning and assays were conducted by the local hospital under standardized conditions.

The Beck Anxiety Inventory (BAI) is a 21-item self-report measure of anxiety symptoms. The items range on a scale from 0 (not at all bothered) to 3 (severely bothered) and cover a range of both the cognitive and somatic symptoms of anxiety [20]. A summed total score provides an indication of the global severity of anxiety (normal to severe anxiety) symptoms. Factor scores were derived based on past research by Beck and Steer: Subjective, Neurophysiological, Autonomic, and Panic. The Subjective factor consisted of the following items: unable to relax, fear of the worst happening, terrified, nervous, fear of losing control, and scared. The Neurophysiological factor consisted of: numbness, wobbliness, dizzy, unsteady, hands trembling, shaky, and faint. The Autonomic factor consisted of: feeling hot, indigestion, face flushed, and sweating. The Panic factor consisted of heart pounding, feelings of choking, difficulty breathing, and fear of dying [22]. Factor scores have been shown to have adequate psychometric properties [23].

## Results

### Demographics

The mean age of the 582 participants was 61.5 years (sd = 12.70, range = 40-96). One hundred and eighty-two participants were male and four hundred were female. Current household income was as follows: <$10,000 = 17%, $10,001-$20,000 = 26%, $20,001 - $30,000 = 16%, $30,001 - $40,000 = 10%, $40,001 - $50,000 = 9%, $50,001 - $60,000 = 4%, $60,001 -$70,000 = 5%, >$70,000 = 13%. In the sample there were 331 self-identified as non-Hispanic and 251 as Mexican Americans. One hundred and sixty participants were assigned a diabetes diagnosis (92 Mexican Americans and 68 non-Hispanics). The descriptive statistics were compared using t-tests (age, education, BAI total and factor scores) and chi-square (gender, diabetes diagnosis) analyses. The Mexican American sample was significantly younger, completed fewer years of education, and was more likely to have a diagnosis of diabetes when compared to non-Hispanics. There was no significant difference in gender distribution. The groups did not endorse a significantly different level of anxious symptoms in the BAI (total score or subfactors). Descriptive statistics of the sample can be found in Table 1.

Linear regression models were created with BAI scores entered as the predictor variables and diabetes diagnosis as the outcome variables; age and gender were entered as covariates. In separate regressions, the BAI total score and each of the factor scores significantly predicted diabetes diagnosis. Models were also run separately by ethnicity. Specifically, among Mexican Americans, diabetes diagnosis was

significantly related to BAI total score B = 4.76 (1.2), t (219) = 3.83, $p < 0.001$ accounting for 10% of the variance above and beyond age and gender. In addition, the diagnoses were significantly related to all of the BAI factor scores. Specifically, Panic, B = 0.68(.26), t (227) = 2.5, $p = 0.01$, explaining 4% of the variance, Autonomic, B = 1.03(.35), t (226) = 2.99, $p = 0.003$, accounting for 8% of the variance above and beyond age and gender, Neurophysiological, B= 1.50 (.46), t (223) = 3.23, $p = 0.001$, accounting for 6% of the variance above and beyond age, and Subjective, B = 1.20 (.49), t (227) = 2.48, $p = 0.014$, accounting for 6% of the variance over and above age and gender for each factor.

Interestingly, diabetes diagnosis was not related to BAI total or factor scores among non-Hispanics. For both groups, age and gender did not account for a significant amount of variance. These were also no differences between controlled (according to HbA1c levels) and uncontrolled diabetics. Regression results are listed in Table 2.

## Discussion

Diabetes is one of the major public health problems today. There is also a noted relation between individuals with diabetes diagnoses and psychological dysfunction, such as anxiety and depression [12]. There appears to be a strong correlation between anxiety and diabetes within the Hispanic population and diabetes diagnosis rates are predicted to increase rapidly among Hispanics [2,24]. Consequently, an increase in anxiety symptoms and anxiety related disorder diagnosis in Hispanics is likely [24]; however, this is the first study to explicitly study the link between anxiety symptoms (rather than global anxiety scores or anxiety diagnoses) and diabetes among rural-dwelling Mexican American adults.

Our findings support the notion that symptoms of anxiety are related to a diagnosis of diabetes among rural-dwelling Mexican American adults, but not non-Hispanic adults, accounting for 6-10% of the variance. This relationship held for global anxiety score as well as specific symptom clusters of anxiety. The results demonstrated that a diabetes diagnosis among Mexican Americans was related to symptoms of Panic such as heart pounding and feelings of choking, Autonomic symptoms including feeling hot and indigestion, Neurophysiological symptoms including numbness and wobbliness, and Subjective symptoms, such as being unable to relax and fear of the worst happening. Our finding that diabetics experience anxiety is consistent with previous studies that have examined global anxiety scores or anxiety disorder diagnoses and particularly within the Hispanic population and therefore further support previous research. Future work should examine how the current findings are impacted by psychological treatment and the longitudinal interactions between diabetes and anxiety [12,15,24].

| | Mexican Americans | Non-Hispanics | p-value |
|---|---|---|---|
| | Mean (sd) | Mean (sd) | |
| Age (years) | 55.9 (10.4) | 65.6 (12.7) | <0.01 |
| Education | 7.5 (4.0) | 13.20 (2.7) | <0.01 |
| Diagnosis of Diabetes | 92 (out of 232) | 68 (out of 317) | <0.01 |
| BAI Total score | 6.4 (8.0) | 5.8(6.3) | >0.05 |
| BAI Subjective | 1.9 (3.0) | 1.5 (2.4) | >0.05 |
| BAI Neurophysiological | 2.2 (2.9) | 2.1 (2.6) | >0.05 |
| BAI Autonomic | 1.6 (2.2) | 1.5 (1.8) | >0.05 |
| BAI Panic | 0.91 (1.6) | 0.68 (1.3) | >0.05 |

**Table 1:** Descriptive Statistics of differences Among Mexican Americans and Non-Hispanics in Age, Education, Diagnosis of Diabetes, and BAI Scores.

| Model | B(SE) | t-value (df) | p-value |
|---|---|---|---|
| **Mexican Americans** | | | |
| BAI Total Score | 4.76 (1.2) | 3.83 (219) | 0.001 |
| BAI Subjective Factor | 1.20(0.49) | 2.48 (227) | 0.010 |
| BAI Neurophysiological Factor | 1.50(0.46) | 3.23 (223) | 0.001 |
| BAI Autonomic Factor | 1.03(0.35) | 2.99 (226) | 0.003 |
| BAI Panic Factor | 0.68(0.26) | 2.5 (227) | 0.010 |
| **Non-Hispanics** | | | |
| BAI Total Score | 0.28(1.1) | 0.26 (303) | 0.800 |
| BAI Subjective Factor | -0.40(.41) | -0.96 (307) | 0.340 |
| BAI Neurophysiological Factor | 0.61(.46) | 1.31 (305) | 0.190 |
| BAI Autonomic Factor | 0.08(.30) | 0.28 (308) | 0.780 |
| BAI Panic Factor | -0.06(.23) | -0.26 (307) | 0.800 |

Note: Age and gender were entered as covariates.

**Table 2:** Results of Regression Analyses of Diabetes diagnoses on Anxiety symptoms in Mexican Americans and Non-Hispanics.

Previous research has examined the relationship between anxiety and diabetes in the general population [12], but there has been no research examining the relationship between anxiety symptoms clusters and diabetes among Mexican Americans. This relationship is important to investigate, since the symptoms of anxiety are likely to impact diabetics differently. As such, our findings provide initial support for a relationship between anxiety symptoms and diabetes in a rural Mexican American population and provide support for the need to evaluate anxiety symptoms.

Importantly, it is difficult to diagnose and treat minority patients in a primary health care setting who present with comorbid psychological deficits and medical problems. These difficulties are linked with diminished daily functioning ability and an escalated level of dependence on health care services [25]. There is a growing concern about health care related issues in the medical and mental health field within the older adult population, particularly in Hispanics/Latinos. Different minority groups experience health disparities and do not make attempts to access and utilize health care as efficiently as their non-minority counterparts. When services are utilized, racial and ethnic minority groups do not typically achieve similarly positive treatment outcomes as their white counterparts [26]. The comorbidity of diabetes and anxiety has received a great amount of attention in the literature due to the potential of anxiety negatively impacting adherence to diabetes treatment. As such, treatment of anxiety symptoms may lead to an increase in motivation for self-care regimens in diabetic patients [27].

This study found a significant relationship between anxiety symptoms and diabetes among Mexican Americans and provides initial support for this association, and, suggests possible clinical implications for practitioners. Providing useful information on mental health (e.g., anxiety symptoms) to patients with a diagnosis of diabetes will, hopefully, be beneficial, in terms of understanding how to manage both their diabetes and anxiety symptoms, and in being more compliant with their diabetes medication, particularly among Hispanics who have been reported to seek and comply with treatment less frequently than their white, non-Hispanic counterparts [26]. Further, mental symptoms may lead to adverse health habits and sedentary lifestyles such as physical inactivity, high-fat diet, central obesity, or smoking [16]. Therefore, being aware of potential psychological and subsequent health risk factors for diabetes will be important for the clinician to relay to their patients in all community settings (including rural communities).

Some limitations of this study include that this study was cross-

sectional in nature, and, therefore, we were unable to examine a causal relationship between anxiety and diabetes. However, this study is an ongoing study and future research will entail looking at the direction of this relationship once longitudinal data is collected. Additionally, this study did not control diagnosis of anxiety disorders or for anxiety medications. This study did not examine gender differences in anxiety symptoms and diabetes and should be investigated. Future studies should examine these limitations. In contrast, strengths of these findings consist of examining an underserved rural population and the participants were recruited from a community-based sample. Our findings in this rural population indicate that anxiety and diabetes is present in individuals in this area and there is a need for medical professionals to be aware of the co-occurring problems when they present for medical treatment.

## Acknowledgments

The authors would like to thank the entire research team with special thanks to the people of Cochran County and Parmer County as well as the respective Community Advisory Boards. We thank Cochran County Memorial Hospital, Parmer Medical Center, the Parmer County Rural Health Clinic and their staff for all of their assistance and provision of office space. This work would not have been possible without the assistance of our community recruiters, Joel Torango, Lousinda Anguiano, Bennie O'Brien, and Rosemary Mccallum.

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