The Co-Existence Of Diabetes Mellitus Type 2 And Depression Symptoms In Mexican American Adults: Its Relation To Glucose Control, Perceived Stress And Physical Health

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THE CO-EXISTENCE OF DIABETES MELLITUS TYPE 2 AND DEPRESSION SYMPTOMS IN MEXICAN AMERICAN ADULTS: ITS RELATION TO GLUCOSE CONTROL, PERCEIVED STRESS AND PHYSICAL HEALTH

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DEDICATION

I dedicate this dissertation to my husband Benjamin Rincon, Jr. and to my son Austen Isaac Briones who supported me during this arduous journey. There are not enough words that can express my gratitude for all your encouragement through *consejos* and actions that lifted me up when I was ready to give up. I know that without your presence and help my goal would have been more difficult to reach. You both sacrificed a great deal of time with *mamá* and stood firm by my side to see me reach my goal.

Ben, I thank you for making me laugh when I needed it, for believing in me, and for loving me. Austen, I am proud of you and I hope that this dissertation serves as an attestation that with hard work and perseverance dreams do come true. Remember that helping those in need brings great joy and value to life.
THE CO-EXISTENCE OF DIABETES MELLITUS TYPE 2 AND DEPRESSION SYMPTOMS IN MEXICAN AMERICAN ADULTS: ITS RELATION TO GLUCOSE CONTROL, PERCEIVED STRESS AND PHYSICAL HEALTH

by

GUILLERMINA SOLIS, RN, MS, NP-C

DISSERTATION
Presented to the Faculty of the Graduate School of The University of Texas at El Paso in Partial Fulfillment of the Requirements for the Degree of

DOCTOR OF PHILOSOPHY

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ABSTRACT

Type 2 diabetes is a common chronic metabolic disease affecting 23.6 million people (7.8%) in the U.S. and is the 6th leading cause of death among adults (CDC, 2007). Mexican-Americans, the largest group within the Hispanic U.S population, have double the rate of type 2 diabetes. Long-term glucose control (HbA1C) is essential to lessen the risk of diabetes complications; self-care demands for diabetes management may be overwhelming and creates stress that predisposes individuals to depression and affects long-term glucose control (Anderson et al., 2000; Black, 1999; Black, Markides, & Ray, 2003). The purpose of this study was to evaluate the presence of depression symptoms in Mexican-American adults with type 2 diabetes and its association with glucose control and identify factors that influence its association with perceived stress, and physical health. Participants (N=141) with self-report of type 2 diabetes for more than one year were recruited from private primary care clinics in El Paso, Texas. This was a quantitative, cross-sectional study that utilized parametric and non-parametric statistical analyses according to research questions addressed. Five questionnaires/instruments were completed by participants and a blood sample for HbA1C was obtained. No relationship was identified between HbA1C and depression symptoms; participants using insulin had a higher level of HbA1C than those with oral medications. Depression symptoms (BDI-II) score was related to sex, perceived stress, physical health, and medical history reported by participants. The perceived stress was related to age, education, and acculturation. Physical function was related to age and income and affected by the combination of BDI-II score and HbA1C results, and independently by perceived stress. The implications of this study are that the high prevalence of depression symptoms and its association with several study variables bring attention to the need for evaluating the psychological state of individuals with type 2 diabetes. Additionally, the percentage of participants outside the recommended HbA1C levels indicates a predisposition to diabetes complications. The treatment approach needs to include evaluation and management of depression on a regular basis for timely intervention. An interdisciplinary health care team
approach for provision of holistic care of individuals with type 2 diabetes may be helpful in guarding against potential diabetes complications.
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CHAPTER 1

INTRODUCTION

Type 2 diabetes is a common chronic metabolic disease affecting 23.6 million people (7.8%) in the U.S. and is the 6th leading cause of death among adults (CDC, 2007) and it has reached epidemic proportions in the world (WHO, 2008). Mexican-Americans, the largest ethnic group within the Hispanic U.S. population, have a rate of type 2 diabetes nearly twice than Euro-Americans. Along the U.S.-Mexico border the rate of diabetes has been reported as high as 16% (PAHO; Pan-American Health Organization, 2005). Maintaining near normal glucose level in individuals with diabetes is the key factor in minimizing potential complications of this metabolic disease. Long-term glucose control is the gold standard measure to define level of glucose control and is monitored by primary care providers on a regular basis as part of diabetes management. The largest portion for type 2 diabetes management falls on the shoulders of individuals affected by this disease who have to make life-style adjustments in the most basic functions such as eating, physical activity, and strict adherence to medications which may interfere in their daily lives. The self-care demands for diabetes management may be overwhelming and creates a greater level than stress; these factors predispose individuals with type 2 diabetes to depression and affects long-term glucose control (Anderson et al., 2000; Black, 1999; Black, Markides, & Ray, 2003).

In order to gain greater understanding of the factors that affect individuals with type 2 diabetes, a research study was carried out. This research focused on Mexican-American adults with type 2 diabetes living in El Paso, Texas.
Specific Study Aim

The purpose of this study was to evaluate the presence of depression symptoms and its association with glucose control in Mexican American individuals with type 2 diabetes and determine factors that influence its association with perceived stress, and physical health of affected individuals.

The proposed study will assist in understanding factors that may predispose Mexican American individuals with type 2 diabetes to depression symptoms and evaluate the impact that these factors may have in glucose control. Knowledge gained will increase clinician’s awareness of risk factors predisposing individuals to depression symptoms and be able to screen appropriately and timely to create positive outcomes in the management of both conditions and improve overall patient’s health and quality of life.

Research Questions

The research questions guiding this study are:

1) What are the demographic characteristics of individuals with type 2 diabetes?

2) Does the method of diabetes medication treatment (oral agent vs. insulin therapy) impact Perceived Stress Score?

3) Is there a protective effect of culture on depression symptoms after controlling for age, education, and income?

4) What is the association between depression scores and glucose control?

5) Do depressive symptoms mediate the effect of Perceived Stress on glucose control?

6) Are depression symptoms scores associated with past history of depression, reported additional illnesses, and number of years with type 2 diabetes?
7) What is the relationship between depression symptoms, glucose control, and physical function?

**Background and Significance**

**A. Diabetes**

Type 2 diabetes is a serious public health problem affecting people throughout the world and accounts for 90%-95% of the total cases of diabetes worldwide (WHO 2008; CDC, 2007). It is a chronic metabolic disease characterized by hyperglycemia caused by a defect in insulin secretion, insulin action, or a mixture of both (Powers, 2008; Dunphy, Winland-Brown, Porter, Thomas, 2007). Insulin is necessary for the metabolism of carbohydrates and lipids and is especially important in the conversion of glucose to glycogen, which lowers the blood glucose level. There are more than 180 million adults in the world affected by diabetes (WHO, 2008). The estimated cost associated with diabetes in the U.S. exceeds $174 billion (CDC) with $116 billion spent in direct medical cost and $58 billion spent in indirect medical cost such as work loss, disability, and early death. People with diabetes spend more than twice the amount of money in medical costs than those without diabetes (CDC, 2007).

The long term effects of diabetes include damage to the eyes, kidneys, nerves, heart and blood vessels (CDC, 2007). The burden of type 2 diabetes includes a greater mortality rate associated with renal failure (10-20%) and cardiovascular disease (50%), particularly heart disease and stroke (WHO, 2008). It is estimated that without significant action, deaths related to diabetes will double in the next decade (WHO, 2008).

Glucose control is fundamental in the management of diabetes and has strong predictive value for diabetes complications (UKPDS, 1998; ADA, 2010; CDC, 2007). Glycosylated hemoglobin (HbA1C) is a blood test used to measure average long-term blood sugar level and is
the recommended test for determining glucose levels approximately every three months. The target HbA1C to prevent diabetes complications is $\leq 7\%$ (ADA, 2010) and is highly dependent on the person’s ability to adhere to the indicated treatment on a daily basis. Individuals with diabetes need to make life-style modifications in order to maintain glycemic control. Some of the requirements are careful adherence to dietary restrictions, exercise on a regular basis, glucose monitoring by finger stick, and often times daily intake of prescribed medications. Prescribed medications may consist of one or more oral agents or insulin injections which may be administered daily or more frequently depending on type of insulin used. Meticulous feet care for observation and prevention of ulcerations is required for individuals with diabetes. Persons with diabetes require adherence to medical visits at least four times a year and may include additional visits to medical specialty services such as ophthalmologist or podiatrist (ADA, 2010). Diabetes is considered one of the most demanding chronic medical illnesses because a large portion of the disease management is carried out by the affected individual.

**B. Diabetes in Mexican-Americans**

Hispanics, which comprise approximately 15% of the total U.S. population is the fastest growing minority group in the U.S. and report a 10.4% incidence of diabetes among adults 20 years and older (CDC, 2007). Among the Hispanic population Mexican Americans (MA) comprise the largest ethnic minority group and the incidence of type 2 diabetes doubles as compared to the rest of the population. The prevalence of type 2 diabetes in MA adults is 11.9% (CDC, 2007). Mexican-Americans also report higher rate of complications which include renal disease, limb amputation and blindness; the death rate is also higher than in other Hispanic ethnic groups (Smith & Barnett, 2005).
The presence of type 2 diabetes is felt greatly along the U.S.-Mexico border region where nearly 1.2 million residents (15.7%) are affected by this condition and is the third leading cause of death for those living in the U.S. side of the border (PAHO, 2005). The U.S. side of the border area reports a 16.1% prevalence of diabetes (PAHO, 2005). In El Paso, Texas, 13.7% of the population reported having diabetes (Martinez & Bader, 2007) whereas a *colonia* in El Paso County reported an incident rate of 11% (Anders et al., 2008).

Individuals with diabetes and depression sustain higher health care expenses than individuals with diabetes without depression (Katon, 2005). Approximately $92 million are spent in added cost of treatment associated with diabetes and depression (Egede, Zheng, & Simpson, 2002).

**C. Depression**

Depression is the leading cause of disability in the U.S. and approximately 7.5% (63 million) of the adult population report having at least one episode of depression within the past year (SAMSHA; Substance Abuse and Mental Health Services Administration, 2008) but the life-time prevalence rate increases to 15.2%; recurrent events of depression are common and increase in frequency after each episode (CDC, 2007). Approximately 66% of those affected are reported as having received treatment in the past year. Depression is more prevalent in women than in men (NIMH; National Institute of Mental Health, 2008). The Diagnostic Statistical Manual of Mental Disorders (DSM-IV) manual of mental disorders (APA; American Psychiatric Association, 1994) describes Major Depression Disorder, also called depression, as a clinical condition that is characterized as having one or more occurrences of a Major Depressive Episode. Major Depressive Episode is defined as at least two weeks of depressed mood or the loss of interest and enjoyment in most of activities and persists for most of the day, nearly every
day. The person must also experience at least four additional symptoms from the following: decreased energy, increased fatigability, decrease in activity, difficulty thinking, concentrating, or making decisions, feelings of worthlessness or guilt, disrupted sleep or psychomotor activity, change in appetite or weight, recurrent thoughts of death or suicidal ideation, plans or attempts (APA, 1994). Depression can contribute to or worsen chronic diseases (CDC, 2007). The presence of depression as a comorbidity has been associated with greater physical impairment, poorer perceived health, and increased medication and health care utilization (Black, Ray, & Markides, 1999).

**D. Depression in Mexican Americans**

The reported prevalence rates of depression in Mexican American population are varied and not clear as statistics reported are mainly of the whole Hispanic ethnic group. A study by Riolo et al. (2005) utilized data from the National Health and Nutrition Examination Survey III carried out from 1994 to 1998 by the National Center for Health Statistics to evaluate prevalence of depression by race and ethnicity in the U.S. The listed sampled population was 8,449 and identifies an oversampling of African Americans and Mexican Americans to attain reliable samples. However the publication does not list the total of the population for each of the ethnic groups included (White, African American, and Mexican American). The depression rate of Mexican Americans (MA) was 8% and similar to African Americans (7%); Whites had the highest rate (10.4%). Low educational level and low income have been recognized as risks for depression in this ethnic group (NIMH, 2008; Shmaling & Hernandez, 2005). Hispanics with depression receive less appropriate care for mental illness than Whites (CDC, 2007). Depression symptoms may go undetected in this population because Hispanics tend to emphasize somatic
symptoms and often seek help from primary care providers rather than from mental health providers (Shmaling & Hernandez, 2005).

Access to health care services, especially to mental health care services, is limited because of the lack of health insurance (NIMH, 2008). The length of time living in the U.S. and acculturation level has been identified as risk factors for depression; immigrant Mexicans have less depression than U.S. born Mexican Americans (Shmaling & Hernandez, 2005). The longer the person has been in the U.S. the greater the possibility of depression. Acculturation to mainstream America also appears to influence the presence of depression symptoms; lower acculturation may lessen the presence of depression symptoms (Cheriboga et al., 2007). The presence of strong social support networks and interpersonal functioning have been associated with less depression and are believed to guard against mental health problems in general (Hernandez et al., 2005).

E. Diabetes and Co-existent Depression

Depression in individuals with diabetes is approximately 2.5 times more likely to occur than in those without diabetes (Anderson, Freeland, Clouse, & Lustman, 2001; Egede, Zheng, & Simpson, 2002). The depression rate reported among participants with type 2 diabetes residing in a colonia in the US/Mexico border was 20% (Solis, Wiebe, & Anders, 2008). The health care expenses sustained by individuals with diabetes and depression are higher than those with diabetes alone (Ciechanowski, Katon, Russo, 2000; Katon, 2005). Approximately $92 million are spent in added cost of treatment associated with diabetes and depression (Egede et al., 2002). A meta-analysis study conducted by Lustman et al. (2000) identified a relationship between depression and uncontrolled glucose levels in patients with diabetes. Diabetes complications and mortality for individuals with depression has been reported as being greater than in individuals
with diabetes without depression (Egede, Nietert, Zheng, D., 2005; Katon et al., 2005). The microvascular and macrovascular complications of diabetes are augmented by the presence of depression in diabetes thus contributing to the increased mortality rate in this population (Black, Markides, & Ray, 2003). In spite of the known devastating effect of depression on diabetes, only 31% of patients with diabetes and depression received adequate antidepressant treatment and only 6% received 4-5 sessions of psychotherapy in a 12 month period (Katon, 2008).

Stress may affect glycemic control in two ways; through the psychological mechanisms, and through the effects of treatment adherence. The negative effect of depression is that it may interfere with the person’s ability to carry out the tasks required to control glucose and ultimately may affect glucose control (Skinner, 2004). Individuals with concomitant diabetes and depression have reported greater difficulty with adherence to many aspects of self-care activities (Katon et al., 2005; Skinner, 2004). The psychological demands associated with diabetes self-care regimen and the incidence of complications associated with poor glucose control resulting in functional impairment may influence the presence of depression and its severity (Katon, 2008; Tafet & Smolovich, 2004).

The increased vulnerability to depression in individuals with type 2 diabetes is not yet clearly understood (NIMH, 2005). However, depression involves physiological changes of the neuroendocrine system. The underlying cause of depression is thought to be related to changes in the neurotransmitters in the brain such as Serotonin (5-HT), dopamine (DA), and norepinephrine (NE) which are monoamine neurotransmitters which affect mood and behavior. It is believed that during psychological stress counter regulatory hormones such as catecholamine a neurotransmitter, glucocorticoids, growth hormones, and glucagons are activated (Grisel, Rasmussen, Sperry, 2006). The activation of the counter regulatory hormones
interferes in the action of insulin which is not able to lower glucose but instead elevates blood glucose. The increase in glucose level creates a greater challenge in maintaining metabolic control. Poor glycemic control and functional impairment due to increasing diabetes complications may cause or worsen depression and lessen the response to antidepressant treatment (Lustman & Clouse, 2005).
CHAPTER 2
LITERATURE REVIEW

Overview

Since the late 1990s many studies have been conducted in evaluating the presence of depression in individuals with diabetes and trying to understand the factors contributing to this dyad. The cause for this occurrence has not been clearly identified. However, the major factors identified in the association and/or affected by the coexistence of depression in diabetes are: (1) burden of disease with an increase in morbidity and mortality (Black, 1999; Black, Ray, & Markides, 1999; Black, Markides, & Ray, 2003; Anderson et al., 2001), (2) contributor of glucose control (Anderson et al., 2001; Fisher et al., 2001; Gross et al., 2005; Lee et al., 2009; Mier, Medina, & Ory, 2008; Pineda-Olvera et al., 2007); (3) adherence to diabetes demands/treatment which may increase glucose level and stress (Rivera, 2003; Sacco et al., 2007; Spencer et al., 2006), and (4) effect on health-related quality of life such as quality of life exhibited by reported decline in physical, social, role functioning, and perceived health status (Black & Markides, 2003; Ciechanowski, 2000; Fisher et al., 2001; Gross et al., 2005; Kaholokula et al., 2006; Lee et al., 2009).

B. Quality of Life

The burden of personal diabetes management creates significant physical and emotional stress which diminishes quality of life and is thought to be a major contributor to presence of depression (Anderson et al., 2000; Black, 1999; Black, Markides, & Ray, 2003; Golden, Lazo, Carnethon, 2008; Katon, 2008). The stress may not always be physiologically related but may be due to the disease burden on patients with limited income and education. In a study by Spencer et al. (2006), diabetes-specific emotional distress was identified to be correlated with education and
income in the Hispanic group. In recent study individuals with type 2 diabetes with and without depressions were compared, results indicated that the physical and mental health summary score of individuals with depression was worse than those without depression (Lee et al., 2009).

C. Mexican-Americans with Diabetes and Depression

The coexistence of type 2 diabetes and depression among Mexican Americans has been reported mainly in retrospective studies (Anderson et al., 2001; Black, 2000; Black et al., 2003). Most of the information gained on the presence of depression and diabetes in Mexican Americans has derived from the Hispanic Established Populations for the Epidemiological Studies of the Elderly (HEPESE) limiting the number of studies available in this population. The HEPESE study included 3,050 participants 65 years of age and older and most were Mexican American. It is the first largest study of Hispanic community residents from the five southwestern United States (Texas, California, Arizona, New Mexico, and Colorado) approximately 85% of the participants were identified as Mexican American (MA) (Black et al., 2003). The rate of depression in individuals who self-reported having diabetes was 31% (n=636) and the non-diabetic group was 24.1% (n=2,196) (Black, 1999). The EPESE surveys were conducted in various series; the first was from 1993 to 1994, the second from 1995 to 1996, the third from 1998-1999, and the last wave from 2000-2001 (Black, 1999; Black, Ray, & Markides, 1999; Black et al., 2003). The EPESE study included multiple measures to gain comprehensive knowledge of the health state of Hispanic elders. The limitations of these studies is that they have been conducted in an older population which has a greater incidence of type 2 diabetes than in a younger population (CDC, 2007), and the validity of self-report of diabetes without evaluation of glucose level comes to question.
The metabolic control, measured by the HbA1C, associated with diabetes and depression was evaluated by Pineda-Olvera et al. (2007) in a group of Latina women (N=96) between the ages of 18-65 years who received care in community clinics in the West Dallas, Texas area. Metabolic control was examined based on the HbA1C recorded in the medical record six months before the interview. Only 84% (n=81) had a HbA1C recorded. The mean educational level of participants was 6th grade (SD= 3.9) and the mean income was $12,957 (SD= $7,385). The rate of depression using the Center of Epidemiologic Studies Depression Scale (CES-D) in this group was 32.3% (n=31). The average HbA1C in the depressed group was 9.09% (SD= 2.15%) whereas the non-depressed group was 7.94% (SD=2.30). The correlates identified with poor metabolic control were: number of years with diabetes, demographic and disease related variables. Social support was also measured in the study and those with increased support had better glucose control. This study is one of the few that evaluated the effect of depression in glucose control in a Latino group; approximately 68% of the participants were Mexican-American. The limitation from this study is that it was conducted in women, who have a higher incidence of depression (NIMH; National Institute of Mental Health, 2008) and the HbA1C was completed six months prior to data collection with only 80% completion.

One of the recent studies of MA is a cross-sectional study from a survey conducted from 2004-2005 (Mier et al., 2007) which evaluated the personal and social factors that may influence on the prevalence of depression symptoms in Hispanic adults 18 and older with self-report diagnosis of type 2 diabetes. The research was carried out in two population groups in the Lower Rio Grande Valley in South Texas: one in Southern Texas, US (n=172), and in Tamaulipas, (Northern) Mexico (n=200). Participants were asked to identify frequency of glucose monitoring and whether this was a painful procedure in order to elicit information on the barriers
encountered with diabetes management. The findings identified that the burden of diabetes symptoms was the greatest predictor of clinical depression symptoms. The rate of depression measured with the Center for Epidemiological Studies Depression Scale (CES-D) was similar in both groups (39% and 40.5%). The population in the Southern Texas area is much like that in El Paso County.

Mier et al. (2008), in collaboration with additional co-authors, published further components of the same research study and focused on evaluating current state of recommended national guidelines for co-existing conditions with type 2 diabetes. The study addressed the relationship between depression symptoms, measured by the CES-D, and self-report health factors of co-existing conditions such as high cholesterol, hypertension, and heart disease. The study also evaluated the participants’ experiences in diabetes management. The correlation between depression symptoms and the recommended HbA1C was evaluated. Reported glucose control was an HbA1C level completed within a year and recorded in the medical record. A positive correlation between depression symptoms and HbA1C was reported in this study. This study is valuable in identifying the prevalence of depression in Mexican Americans but no identification of its effect on glucose level.

Literature review support the presence of depression in individuals with diabetes and worsening condition of diabetes control is acknowledged. However, only two studies (Pineda-Olvera et al., 2007; Fisher et al., 2004) evaluated HbA1C. The data for glucose level was incomplete in the Pineda-Olvera et al. (2007) study with only 84% of the participants having an HbA1C recorded in the medical record. The lack of consistency and uniformity in glucose testing is not addressed in the Fisher et al. (2004) study. Additionally, most of the information
ublished in the coexistence of diabetes and depression is the result of the Hispanic-EPESE study conducted in elderly.

The proposed study will provide the opportunity to evaluate the presence of depressive symptoms and their relation with glucose levels by obtaining a HbA1C at the time of the interview which has not been done previously in MAs.

**Conceptual Framework**

The framework is based on the premises that glucose control in individuals with type 2 diabetes is influenced by the person’s psychological state. Persons with type 2 diabetes require adherence to the following: specific dietary intake, exercise on a regular basis, daily intake of medications, regular visits to health care providers, and meticulous foot care. Carrying out these demands require personal motivation, adequate finances, access to health care and ongoing social/familial support. The demands created by this condition place the individual at risk for chronic psychological stress. Lazarus (1966, p.2), who is credited for expanding the concept of stress, defines stress as a “universal human phenomena that results in intense and distressing experience and appears of tremendous influence in behavior”. According to Lazarus, the person determines the level of stress caused by the condition based on the personal perception of the situation or events. The definition of stress was broadened further by Lazarus & Folkman (1984) to try to identify individual differences in the perception of the stressor and in understanding the response to stress. Therefore, it is now considered that the person’s ability to adapt to the stressor is determined based on the following: the life event affecting the person (stressor), the person’s coping ability, the person’s characteristics, and by the person’s environment (Lazarus & Folkman, 1984). Persistent stress creates a psychologically negative stimulus that initiates a physiological response to stress. Depression symptoms are a type of negative effect which
occurs when the situation is appraised by the individual as hopeless or overbearing. A relationship between stress/diabetes and metabolic effect has been described by Golden (2007).

A three tier framework (Figure 1) is drawn to illustrate the factors that predispose MA individuals with type 2 diabetes to depression symptoms and ultimately exerts an effect on glucose control. The first tier lists the personal characteristics of the individual affected, type of diabetes treatment, and components of the medical history as basis for creating chronic stress and increasing possibility of depression symptoms. Mexican Americans are at high risk for limiting self-care and affecting diabetes management because of their limited health care services due to lack of health insurance, low level of education, and lower income level as compared to other ethnic groups. Acculturation plays a role in the propensity of MA to experience depression symptoms; lower acculturation to American mainstream culture, means less propensity to depression symptoms. Individuals with type 2 diabetes who require daily Insulin injections have been reported as having more stress and more risk for depression symptoms than those who only take oral medications. The addition of chronic illnesses and the longer the person had had diabetes the higher the possibility of developing depression symptoms. Additionally, recurrence of depression over the life span increases with each experienced episode of depression; thus individuals with diabetes who have past history of depression will be more likely to report depression symptoms.

The second tier of the framework identifies perceived stress (PSS) as being a possible consequence to type of treatment and demographic characteristics thus predisposing individuals to occurrence of depression symptoms and affecting glucose control. The presence of depression symptoms (BDI-II) is seen as a mediator between the effects of perceived stress on glucose control (HbA1C).
The third tier of the framework indicates how the presence of depression symptoms may interfere with the person’s physical activity. The lack of physical energy and possibly decreased motivation which may be seen as depression symptoms interfere in diabetes self-management and glucose control. Physical function is seen as a bi-directional effect on depression symptoms (BDI-II) and on glucose control (HbA1C).

Figure 1: Conceptual Framework

CHAPTER 3

DESIGN AND METHODS

This was a cross-sectional descriptive study for the purpose of evaluating the presence of depression symptoms and their association with glycemic control (HbA1C), perceived stress, and physical function in Mexican- American (MA) adults with type 2 diabetes. The knowledge gained of the association between diabetes and depression symptoms and the factors influencing this dyad will assist health care practitioners to better understand this condition and design treatments that address the psychological and the metabolic needs of affected individuals to improve overall health outcomes.

Research Setting

El Paso, Texas is a city in El Paso County, and is located along the US-Mexico border whose residents are predominantly of Mexican American origin. Approximately 78% of the Hispanic residents were born in Mexico or are of Mexican descent (US census bureau, 2005). The city of El Paso is the largest border city along the U.S./Mexico and the latest statistics reveal an 8.1% prevalence of diabetes among Hispanics as compared to 5.5% of non-Hispanic (Texas Department of State Health Services, 2008). The prevalence of diabetes in the area has been reported as high as 13-15% (Anders et al., 2008; Martinez & Bader, 2007). Previously reported rate of depression among individuals with diabetes residing in a colonia in El Paso County was 20% (Solis, Wiebe, & Anders, 2008). Participants were recruited from several private family clinics on the East side of El Paso, TX South of I-10 Paso where approximately 35% of the city’s population resides (US Census Bureau, 2005). The clinics were located within a 2-mile radius from each other and share a similar patient population.
The participating clinics were Candelaria Medical Center, Tarango Family Clinic, and Valley Medical Clinic. Persons who receive health care services in private practice settings tend to have coverage for services. Provision of coverage may be from private insurances, state, and/or federal programs. The selected sites provide primary care services with similarity of population served. Additionally these health clinics serve a similar demographic population. A written agreement from each participating site will be obtained prior to recruitment of participants to create a cooperative environment that would lead to satisfactory relationship between PI and Health Care providers (Appendix A).

Sample Population

This was a convenience sample of adult population. Participants were recruited from the previously listed clinics while waiting to be seen by their health care providers. The inclusion criteria for this study were: 1) males and females 18 years old and older who self-report being diagnosed with type 2 diabetes by a health care provider; 2) self-report type 2 diabetes for one year or longer; 3) ethnically identified self as Mexican (born in Mexico), Mexican-American, or of Mexican descent whose parents or grandparents were born in Mexico; 4) under medical care for diabetes treatment in the U.S. 5) able to read and write English, Spanish or both in order to complete forms and questionnaires 6) willingness to participate in this study. Criterion Four was established for Primary Investigator to be able to inform health care provider of HbA1C results. The exclusion criteria were based on self-report of the following: 1) physical and or mental conditions that interfere with participation, 2) Inability to obtain venous blood sample, and 3) End-stage Renal Disease.
Sample Size

The prevalence of depression in Mexican American individuals with diabetes has been reported between 20-40% (Anders et al., 2008, Black, Markides, & Ray, 2003). The effect size, used for sample analysis, was based on determining the association between diabetes and a presence of depression symptoms. A multiple regression statistical analysis was conducted. An F test calculation was conducted taking into consideration 12 predictors, Effect size $f^2 = .15$, $\alpha = 0.05$, and Power ($1-\beta$ err prob) = 0.80. This yields an N= 127 (Faul, Erdfelder, Land, & Buchner, 2007). Because of the possibility of participant attrition, such as not completing all study questionnaires, 13 participants (10%) have been added to the calculated sample size leading to a grand total of N= 140 participants.

Participant Recruitment Procedure

The Primary Investigator (PI) or the Research Assistant (RA) obtained written approval for patient recruitment from each of the selected clinical sites. A brief written screening for recruitment of participants was conducted by the PI or RA to identify potential participants in the following manner: every person in the waiting area was given a note where potential participants identified themselves as willing to talk to the investigator (Appendix B). If the person agreed to talk to the investigator for possible participation, the informed consent was read and obtained by the PI or RA; questions posed by the participant were answered in the participant’s selected language prior to further proceedings (Appendix C and D). Once the consent was signed, verification of inclusion and exclusion criteria took place.

The questionnaires required for the study were presented and explained for its completion during this session. The forms and questionnaires that were completed included: 1) Information of to the Health Care Provider notifying of patient’s participation in the study, 2) Demographic
questionnaire to gain information on participant, 3) BDI-II to measure depressive symptoms, 4) SF-36v2 Physical Cumulative Score for evaluating physical function, 5) Perceived Stress Scale to measure level of stress, and 6) Acculturation scale to determine level of acculturation to U.S. culture.

The PI and or the RA were available on site at all times to clarify or assist in the completion of the materials. All participants completed the questionnaires in a private area in the clinic.

A venous blood test, in a non-fasting state, was drawn for measuring the HbA1C during the same session. A certified phlebotomist was available on site to obtain the sample and forward it to a National Certified Laboratory in El Paso, TX that was contracted for this study. Results were available to the PI within 10 working days. Water and low carbohydrate snacks were available for participants during the data collection period to maintain energy level during the completion of questionnaires.

A note was given to each participant to take to their health provider notifying them of patient’s participation in the study (Appendix E). Additionally, participants provided PI with addressed envelope listing to notify of their HbA1C results if ≥8%. If the HbA1C was ≥8% but ≤9.0%, a report of the result was provided to the patient by the PI, via certified mail, to take to their health care provider in their next scheduled appointment. If HbA1C ≥9.0%, a glucose equivalent to (240 mg/dl) the PI provided a note to the patient, via mail, to take to their health provider within 30 days listing the results of the HbA1C (Appendix F). The participants received a gift card for $15.00 redeemable at a local store as a token of appreciation for their valued time and information.
The RA, who is a graduate student in a Master’s program with experience in data collection, was trained by the PI prior to initiation of the study to assist in the recruitment and administration of questionnaires. The RA and PI are fluent in Spanish and fully aware of Mexican-American culture and were able to interact with participants and explain or clarify information presented. Retraining took place after the first week of the research study based on the need of the RA and PI to clarify the procedure for participating clinic staff. The RA was also responsible for inputting the data in an Excel spread sheet at the completion of data collection process.

**Instruments**

**1. Measure of Depression Symptoms**

The presence of depression symptoms was evaluated using the Beck Depression Inventory-Second Edition (BDI-II; Beck, Steer, & Brown, 1996). The term “depression” in this study referred to the self-report of depressive symptoms indentified in the BDI-II. The BDI-II was developed to assess the presence of symptoms that are aligned with the criteria for diagnosing depressive disorders described in the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; American Psychiatric Association, 1994). The BDI-II alone does not serve as a diagnostic measure for depression.

The original instrument was the BDI published in 1961 based on described symptoms reported by psychiatric patients with depression and not often reported by psychiatric patients who were not depressed (Beck et al., 1996). The format of the BDI-II test is for the participants to select and circle the number beside one of the four phrases listed that best describes their state in the past two weeks including the day the questionnaire is answered. The instrument consists of 21-items/statements that are self-reported and takes approximately 10 minutes to complete,
and require a fifth–sixth grade reading level to adequately understand the questions. The score ranges from 0-63 to determine possible degree of depression symptoms. The instrument developers established four groups of scores and classified as the following: “minimal 0-13, mild 14-19, moderate 20-28, and severe 29-63” (Beck et al., 1996, p.11). Scores provide an estimate of the overall symptom severity of depression. High scores indicate greater depressive symptoms. It is suggested that if the question regarding suicide and hopelessness are rated with high scores then the participant should be evaluated for potential suicide.

The psychometric properties of the BDI-II English version (Beck et al., 1996) report an internal consistency $\alpha = .92$ when evaluated in 500 outpatients and a coefficient $\alpha = .93$ for 120 college students. Test-retest evaluation on the stability of the BDI-II was based on its administration to 26 outpatients on two occasions, during a first visit and repeated one week later. The test-retest correlation was 0.92 ($p<.001$). The validity of the BDI-II was reported by same authors, who describe the content validity. The BDI-II was developed to examine for presence of depression symptoms based on the criteria for depression listed in the DSM-IV. Convergent validity was carried out by administering the BDI-I and the BDI-II for the first session and another instrument was administered between the two versions. The correlation identified between BDI-I and BDI-II was .93 ($p<.001$).

The BDI-II is available in English and Spanish. The reliability and factor structure of a translated Spanish BDI-II version were evaluated by Wiebe, Penley, & Nwosu, (2003), using a group of medical patients with end-stage renal disease (ESRD) receiving hemodialysis (n=122) in a predominately Hispanic population. The BDI-II was translated into Spanish by several psychologists from the “U.S., Mexico, Central and South America, Cuba, and Puerto Rico” (Wiebe, Penley, & Nwosu, 2003, p. 570). The internal consistency of the Spanish version is
reported as $\alpha=.92$. The item-total correlations ranged from .33, in the suicidal thought or wishes item, to .72 in the item listing worthlessness. The factor analysis carried out using confirmatory factor analysis of same type population and led to acceptable fit of the model that identified general depression factor. The construct validity of the translated Spanish BDI-II was also established by identifying a single construct of depression.

A comparison of the psychometric properties of the BDI-II in English and Spanish was carried out by Wiebe & Penley (2005) in a sample of undergraduate college students (N=895). Participants were primarily Hispanic with most being bilingual. The results demonstrated a similarity of both languages. The reliability measures in the English version was $\alpha=.89$ and in the Spanish version was $\alpha=.91$. Test-retest reliability was carried out by administering the questionnaire one week apart either in the same language each time or in a different language during each session and the results were acceptable. The ICC for the English version was .71 (p<.001) and Spanish version was .86 (p<.001). The scores of those who completed the questionnaires in both language versions one week apart, the ICC was .76 (p<.001). The confirmatory factor analysis was used to evaluate the factor validity of the BDI-II in English and Spanish. This evaluation showed that the English version factor structure demonstrated a good fit with the data from the Spanish version.

2. Serum Glycated Hemoglobin Measure (HbA1C)

Glycated hemoglobin reflects a proportion of glucose level in the blood which occurs when glucose enters the red blood cell. Glycated hemoglobin is a substance in the red blood cells formed when blood glucose attaches to the hemoglobin. It is used to measure blood glucose control over several months and provides an estimate of how well diabetes has been controlled over the last 2 or 3 months. It is the goal standard of care for determining potential risk for
developing problems, such as retinopathy, renal disease, cardiovascular disease, peripheral neuropathy or stroke. Potential complications are especially true if HbA1C remains high for a long period of time (ADA, 2010). The goal for HbA1C in adults is ≤7%; normal HbA1C levels for individuals without diabetes is <6.5%; glucose control is fundamental to the management of diabetes (ADA, 2010). The HbA1C test accuracy may be affected by conditions that affect red blood cell turnover such as hemolysis (red blood cell destruction) and significant blood loss (Dunphey et al., 2007).

Serum blood test for HbA1C was obtained on the same day and in the same clinic site either before or immediately after completing the questionnaires depending on time available in clinic. The blood sample was obtained by venous puncture drawn by a certified phlebotomist and sent to a designated local laboratory with coded identification number.

3. Physical Health Scale an indicator of Quality of Life

The Short Form Health-Related Quality-of-Life Questionnaire (SF-36v2) was designed as a tool to evaluate the physical and mental components of health to draw deductions of an individual’s quality of life (Ware & Kosinski, 2001). This instrument measures the following eight dimensions of health: physical functioning, role limitations due to physical health, bodily pain, general health, vitality, social functioning, role limitations due to emotional health, and mental health (Ware & Kosinski, 2001). Aside from the dimension scores, a Physical Component Summary (PCS) and the Mental Component Summary (MCS) can be derived from the scales. A Likert-type scale score format is used for scoring each item from 1-5. The higher scores describe better health. Each item is scored and evaluated to produce a standardized score ranging from 0-100. Norm-based scoring and interpretation is determined by standardization of
mean scores (50) and standard deviations (10) to the general U.S. population. It is a self-administered 36-item questionnaire which is completed in approximately 7 to 10 minutes.

The psychometric properties of the SF36V2 were documented, including internal consistency reliability, which ranged from $\alpha=.90$ to $\alpha=.94$ for the PCS scale and $\alpha=.85$ to $\alpha=.90$ for the MCS scale. The test-retest reliability for a two-week interval between administrations, in the U.S., identified the following correlation scores: 0.87 for the PCS and 0.74 for the MCS (N=540) (Ware & Kosinski, 2001). Validation methods used in studies of the SF-36v2 follow recommended guidelines by the American Psychological Association, the American Educational Research Association, and the National Council on Measurement in Education which helped design interpretative criterion for the eight scales (Ware & Kosinski, 2001, p.45). The eight scales include health concepts that are highly representative of a person’s health status.

Studies have yielded content, concurrent, criterion, and predictive validity evidence in various applications (Ware & Kosinski, 2001). Reliability and validity of the Spanish version for this instrument was documented in Mexican-American elderly group (N=150) an internal consistency of $\alpha=.80$ was demonstrated with content validity established with the use of a generic health survey used in a similar population (Bennett & Riegel, 2003). Construct validity of the PCS and MCS scale was evaluated with the medical outcome study, measures specific symptoms of physical and mental state, and a strong correlation was identified ($r=0.70$) (Ware & Kosinski, 2001).

The reliability and validity of the SF-36 was examined in a group of older Mexican Americans (N=621) from the Hispanic Established Populations for Epidemiologic Study of the Elderly by Peek et al. (2004). The internal consistency for the eight scales was $\alpha=.76-.96$. The construct validity was evaluated using a confirmatory factor analysis to fit a model using eight
factors that would denote the eight SF-36 scales. The acceptable levels established for determining evidence of construct validity for the model fit was > .90 in the comparative fit index (CFI) and the normed fit index (NFI). Each of the items loaded at .60 or higher except for general health item which was .59. However, most of the items loaded at ≥ .80, supporting the construct validity of the instrument.

4. Demographic Questionnaire

A questionnaire was designed for this study to gain information that would assist in obtaining biographical and health history of the participants. The contents included personal descriptive data such as age, gender, years of education, and income. Personal identification information that may breach confidentiality of participants was not be included. The inclusion of address was obtained separately to be able to send results of HbA1C, if desired. Information was obtained on medical history, current pharmacological diabetes treatment, and whether treatment for depression was in progress. The medical history components is a list of nine illnesses commonly identified with type 2 diabetes where the response is in a dichotomous (yes/no) format with an option to write in additional illnesses not included in the list. The questionnaire was available in English and Spanish and participants selected the preferred language version (Appendix G and H).

5. Stress Appraisal

The Perceived Stress Scale (PSS) is used to measure the degree of stress perceived by each participant (Cohen, Kamarck, & Mermelstein, 1983). It is rated on a 5-point Likert type scale ranging from 0 (never) to 4 (very frequently). Higher scores indicate higher perceived stress. It is a 14-item questionnaire. The PSS score results by reversing the score on the seven positive items: 0=4, 1=3, 2=2, 3=1, 4=0, and adding across all 14 items. Items 4, 5, 6, 7, 9, 10,
and 13 are the positively stated items. It can be administered in few minutes and can be scored easily. The PSS is sensitive to measuring chronic stress occurring from life circumstances, stress from expectations regarding future events, or stress from particular life events. Based on three sample groups, two of college students and one from a community group, the internal consistency reliability was $\alpha=.84$, $\alpha=.85$, and $\alpha=.86$ respectively (Gonzalez-Ramírez & Landero-Hernández, 2007). The evidence for concurrent and predictive validity of the PSS was gathered using correlation between the four additional scales and the PSS. The four scales measured life events, social anxiety, depressive symptomatology, and physical symptomatology. A positive correlation was established between life events, physical symptoms, and social anxiety scales and the PSS with a significance level of $p<.001$. A high correlation was noted between the PSS and the depressive symptom scale but both scales predicted independently physical symptomatology when partial correlations were calculated (Appendix I and J).

The PSS scale was translated into Spanish and used in Guanajuato, Mexico to investigate the influence of perceived psychosocial stress in patients with diabetes mellitus type 2 (Garay-Sevilla et al., 2000). The PSS was further analyzed for cultural adaptation of the Spanish version for its use in Mexican population samples (Gonzalez-Ramírez & Landero-Hernández, 2007). A random sample of university students was used for the study and the internal consistency was analyzed and the factor structure of the Spanish version was compared with the factor structure of the English version. The reported internal consistency was $\alpha=.83$ and confirmatory factor analysis substantiated the factor structure (Gonzalez-Ramírez & Landero-Hernández, 2007).

6. Acculturation Measure

Acculturation has been described as a change process that takes place from continuous exposure between two cultural groups and is presumed to adopt the behaviors and values of a
dominant culture (Berry, 1980). The degree of acculturation was evaluated based on language using the five-item Short Acculturation Scale for Hispanics (SASH; Marin et al., 1987). The questionnaire is self-administered and uses a Likert-type scale with five items with responses ranging from one to five. Score range is from 5-20 with higher score indicating higher acculturation. The statement items included in the questionnaire were created in either English and or Spanish and then each translated using the back-translation technique to evaluate language. Both language versions of the acculturation scale were pretested and Spanish speakers representing several nationalities reviewed the Spanish questionnaire to minimize wording unique to the areas where developed (Marin et al., 1987).

The reliability for the SASH five items that evaluated the language factor was $\alpha=.90$. The validity was established by correlating the participant’s total score of the questionnaire and on each factor with the participant’s generation, proportion of time spent living in the U.S., and the participant’s self-evaluation of his and her level of acculturation (Marin et al., 1987, p.190). The correlation between language and each of the criteria listed above carried out for Mexican-Americans ranged from $r=.70-.84$ and had statistical significance of $p<.001$. (Appendix K and L).

Data Management and Statistical Analysis

1. Pre-Analysis

During the pre-analysis phase, the data were coded to maintain confidentiality for all participants. Participants were given an identification number assigned by the PI for use throughout the study. The original documents are being kept in a secured file cabinet, on the fourth floor of the College of Health Science; the PI is the only person able to access this information and will be secured for five years. In order to carry out quantitative statistical analysis, measurement for variables was established. Demographic information and summative
score of the instruments was obtained as a continuous measure as much as possible to ease the process of designation measure according to statistical analysis. The data were evaluated by the PI for outliers or coding irregularities. It was also cleaned for accuracy and irregularities by the PI after the RA inputted the information. A computer file was established to prepare for further evaluation and analysis. The data were entered onto an Excel format computer file and the SPSS (Statistical Package for the Social Sciences) statistical software was used for data analysis.

In the preliminary assessments for data analysis, the Expectation maximization (EM) method for forming a missing data correlation was used (Tabachnick, & Fidell, 2007) for inputting any randomly missing data. The EM creates a missing data correlation matrix by assuming the shape of the distribution for the partially missing data and bases inference about the missing values on the likelihood under that distribution. The SPSS has the capability for performing EM. This was created using the same statistical software.

In the final assessment of data analysis it was opted not to use EM for missing data but rather compute statistics with the actual obtained sample since few variables missing.

2. Statistical Analyses

A cross-sectional, exploratory research method study was used to evaluate the presence of depression in Mexican American individuals with type 2 diabetes and determine its association with glucose control, perceived stress, and physical function of participants. Table 1 lists each of the research questions, the variables included in each questions, and the statistical analysis carried out to answer each question.
Table 1. Research Questions and Statistical Analysis Conducted

<table>
<thead>
<tr>
<th>Research Questions</th>
<th>Instrument</th>
<th>Statistical Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>What are the demographic characteristics of individuals with type 2 diabetes?</td>
<td>Demographic Questions</td>
<td>Descriptive Analysis</td>
</tr>
<tr>
<td>Does the method of diabetes medication treatment (Oral vs. Insulin) impact PSS score?</td>
<td>PSS score (DV)</td>
<td>$t$-test: Two tailed-test</td>
</tr>
<tr>
<td></td>
<td>Method treatment: oral vs. insulin (IV)</td>
<td></td>
</tr>
<tr>
<td>Is there a protective effect of acculturation in depression symptoms after controlling for age, education, and income?</td>
<td>BDI-II (DV) Age, education &amp; income (Contol) Acculturation (IV)</td>
<td>Multiple Regression: Hierarchical Model</td>
</tr>
<tr>
<td>What is the association between depression symptoms score and glucose control?</td>
<td>HbA1C (DV) BDI-II (IV)</td>
<td>Pearson $r$ correlation</td>
</tr>
<tr>
<td>Do depressive symptoms mediate the effect of Perceived Stress on Glucose control?</td>
<td>A1C (DV) PSS (IV) BDI-II (DV &amp; IV)</td>
<td>Multiple Regression: Mediation</td>
</tr>
<tr>
<td>Are depression symptoms associated with past history of depression, reported additional illnesses, and number of years with type2 diabetes?</td>
<td>BDI-II (DV) Step 1. Past Depression (IV) Step 2. Additional Illnesses (IV) Step 3. Number of years with type 2 diabetes (IV)</td>
<td>Multiple Regression: Hierarchical Model</td>
</tr>
<tr>
<td>What is the relationship between depression symptoms, glucose control, and physical function?</td>
<td>SF-36v2 PCS (DV) BDI-II (IV) HbA1C (IV)</td>
<td>Multiple Regression: Standard</td>
</tr>
</tbody>
</table>

3. Statistical Analyses Description

A description of the statistical analyses procedure is listed for some of the research questions needing further detail.

1. Does the method of diabetes medication treatment, oral agent vs. insulin administration, impact PSS score? Two tailed $t$-test was used as the statistical method to determine whether
the method of treatment to control glucose (oral medications vs. insulin use) had an effect in perceived stress score (PSS).

2. Is there a protective effect of culture on depression symptoms (BDI-II) after controlling for age education and income? Multiple regressions: Hierarchical model was used to identify the effect of acculturation in depression symptoms. In the first step, the effect of extraneous variables (age, education, and income) which has been linked theoretically to influencing the presence of depression symptoms will be controlled. In the second step acculturation score was entered to the regression to determine the contribution of this independent variable to the dependent variable (BDI-II).

3. Do depressive symptoms (BDI-II) mediate the effect of Perceived Stress (PSS) on Glucose control (A1C)? In order to carry out a meditational effect analysis, a relationship between BDI-II scores and HbA1C was established. Because no statistically significant relationship was found between the BDI-II scores and HbA1C, no further testing for mediation was needed. To test the mediation of BDI-II on the effect imposed by the PSS on HbA1C,

4. Are depression symptoms score associated with past history of depression, reported additional illnesses, and number of years with diabetes? A Standard Multiple regression was used to enter in order of believed influence the variables that contributed to the occurrence of depression symptoms (DV). Past history of depression, number of additional illnesses identified by participants, and the number of years with diabetes was entered in the regression model. Three steps were established with BDI-II scores as the dependent variable. In step one, past history of depression was entered in the equation; in step two the number of additional illnesses reported was entered in the equation, and in step the number of years that the participant reported as having had diabetes was entered. Observation was made of the
effect added to the equation when each independent variable was entered to determine the
association of BDI-II scores with each of the listed independent variables.

5. What is the relationship between depressive symptoms (BDI-II), glucose control (HbA1C),
and physical function (SF-36v2 PCS)? Multiple Regressions: A standard multiple regressions
was carried out. The independent variables (BDI-II score and HbA1C) were entered into the
regression equation at once. The BDI-II and the HbA1C were evaluated individually to
determine the contribution each adds to the physical function (dependent variable) that differs
from the other variable.

PROTECTION OF HUMAN SUBJECTS

Approval for this study was submitted to the Institutional Review Board of the University
of Texas at El Paso and approval received on November 5, 2009. An informed consent,
available in English and Spanish, was completed in the participant’s preferred language prior to
participation in the study (Appendix). Restrictions established by the Health Insurance
Portability Accountability Act in accessing medical records and maintaining confidentiality were
followed. All identifiable information was kept confidential and consent forms were number
coded for identification. A logbook identifying the numbers corresponding with each of the
participants’ identifiable information is being kept in a locked file cabinet in the School of
Nursing building, office number 400. This file will be kept for five years after completion of the
study. At the end of this period, records will be destroyed appropriately. The potential risks for
participating in the study were few and included any of the following: (1) becoming fatigued or
nervous while completing the questionnaires, (2) possibility of pain to site during needle stick,
(3) a hematoma at the venous puncture site, and (4) although it is highly unlikely, infection from
the needle stick.
Prompt action was required to insure the safety of the participant or any other person in danger. Participants who verbalize any thoughts of suicide or homicide at any time during the interaction with the RA or PI were to be referred to any of the following community resources immediately: local MHMR Hotline/Mental Health Crisis Hotline (877-562-6467 or 779-1800), the police/sheriff officer (911), the nearest emergency room, or psychiatric hospital. The same prompt action was followed if a participant identifies risk of suicide in question 9 of the BDI-II. Any participant who answered question two (pessimism) as a high rate, was provided information for accessing Mental Health Care services available in the community. Any participant who had problems due to the needle stick was referred to his/her primary health care provider.

Participants whose HbA1C was $\geq 9.0\%$ (average glucose equivalent to 240 mg/dL) were referred to their Primary Health Care Provider for further evaluation within thirty days and a note attesting to this was completed (Appendix B).

This study provided information regarding the psychological state and of the current glucose control state of individuals with diabetes. Information gained augments understanding of the current effect and state of glucose control in Mexican-American individuals with type 2 diabetes and the possible factors predispose to depression symptoms.
CHAPTER 4
RESULTS

The results of this study are presented by addressing each of the seven questions drafted. The data were collected from December 1, 2009 to January 31, 2010 with a total of one-hundred and forty-one participants. The SPSS 17.0 software package was used for conducting the statistical analysis with collected data.

Research Question One: Analyses of demographics, health history, and scales measured

1. Description of the demographic characteristics of participants.

The majority of participants completed the questionnaires in Spanish (n= 86, 61%) and most reported Mexico as their country of birth (n= 90, 63.8%). However, a greater number (n=75, 71.6%) identified themselves as Mexican-American. A large majority of participants were female and age had a wide range from 18-86 years old. In order to illustrate the age distribution, Figure 1 presents a graph of age groups represented and its frequency. The largest portion of participants reported being married (n=70, 50.7%) and the next largest category were divorced or separated (n=25, 18.1%). Twenty-four reported being widow or widower (17.4%) and participants who reported being single represented the smallest group (n=16, 11.6%). Employment status was also reported; those who were retired accounted for the largest group (n=44, 31.9%) and the smallest group was part-time employment (n=18, 13%). Disability status was reported by thirty-five participants (25%) and those who worked full-time were in the lower group (n=18, 13%). Twenty-three participants (16.7%) reported their employment status as housewives.
Education was calculated based on the self-report of formal years of schooling; there were three (2.2%) participants who reported no formal education and three with 18 years of schooling. Formal years of education completed by participants had a wide range of 0-18 years (Median 8, $SIR=3.5$). This created a positively skewed distribution for its analysis. However the distribution is also seen as bimodal because six and twelve years of formal schooling had the highest frequency (n=24, 17.4%; n=27, 19.1% respectively).

A total of 126 participants (89%) provided income data. The yearly household income data had a wide distribution; they were positively skewed with a high percentage of participants reporting lower income in the lower range. Because data collection took place in private primary care clinics, most participants reported having some type of health insurance/coverage. A plurality of participants listed Medicare as a source of health insurance (35.5%), likely due to the large number of participants 61 years old and older. Thirty (21.3%) participants reported having dual eligibility for health care coverage by Medicare and Medicaid. Eleven (7.8%) participants with Medicaid-only health care coverage was the lowest number represented. Twenty-two (15.5%) participants reported having some type of private insurance coverage. A description of the continuous variables depicting some of the demographic information and two of the components of the health history reported by the participants is listed in Table 2. The additional chronic illnesses, total of eight, were selected by the participants from a list provided which included: arthritis, depression, high blood pressure, high cholesterol, heart disease, stroke, kidney disease, and poor circulation.
2. Description of health history components and treatment method.

In this section, the results of the variables describing components of the health history for this research are presented. All information included in the analyses was obtained from the demographic questionnaire which was the participants’ self-report.
One hundred and thirty-nine participants reported the number of years since diagnosed with type 2 diabetes. A wide distribution, positively skewed, was noted with the number of years ranging from 1-45 with a median of eight years ($SIR=5.5$). The majority of the participants described taking medications for diabetes management ($n=121, 86\%$). Participants were asked to list all medications that they were taking and only one hundred and twenty-two responded ($86.5\%$) to this question. The number of diabetes medications reported by participants ranged from 1-4 types with the average being 3 medications. Forty-two participants ($30\%$) reported insulin use for diabetes management.

One hundred and thirty-eight of the participants acknowledged having additional illnesses with diabetes, identified from a list of nine conditions with the option to enter additional conditions. The number of additional illnesses ranged from one to eight with an equal distribution ($M=3, SD=1.5$). The most common chronic illness reported was high blood pressure ($n=108, 77\%$), followed by high cholesterol ($n=89, 63\%$), and problems with circulation ($n=51, 36\%$). The number of additional illnesses ranged from one to eight with an average of three illnesses per participant. The most common chronic illness reported was high blood pressure ($n=108, 77\%$), followed by high cholesterol ($n=89, 63\%$), and problems with circulation ($n=51, 36\%$). In the reported medical history, forty-two participants ($30\%$) recalled being informed that they had depression. Additionally, thirteen participants ($9.2\%$) reported taking antidepressants.

Table 3 describes further demographic data and the components of the health history that were obtained as a dichotomous response. A greater representation of females is noted and approximately two-thirds of the participants were born in Mexico. The majority of participants reported exercising on a regular basis. The percentage of participants who reported having had
depression in the past (31.6%) was only slightly lower than the total number of participants in this study who scored in the mild to severe range level of depression symptoms score (34.8%).

Table 3. Demographic and Health Information of all Participants (N=141)

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>Valid Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GENDER</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>49</td>
<td>34.8%</td>
</tr>
<tr>
<td>Female</td>
<td>92</td>
<td>65.2%</td>
</tr>
<tr>
<td>Missing</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td><strong>BIRTH COUNTRY</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mexico</td>
<td>90</td>
<td>64.7%</td>
</tr>
<tr>
<td>USA</td>
<td>49</td>
<td>35.3%</td>
</tr>
<tr>
<td>Missing</td>
<td>2</td>
<td>1.4%</td>
</tr>
<tr>
<td><strong>HEALTH INSURANCE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>118</td>
<td>84.9%</td>
</tr>
<tr>
<td>No</td>
<td>21</td>
<td>15.1%</td>
</tr>
<tr>
<td>Missing</td>
<td>2</td>
<td>1.4%</td>
</tr>
<tr>
<td><strong>INSULIN USE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>42</td>
<td>30.7%</td>
</tr>
<tr>
<td>No</td>
<td>95</td>
<td>69.3%</td>
</tr>
<tr>
<td>Missing</td>
<td>4</td>
<td>2.8%</td>
</tr>
<tr>
<td><strong>EXERCISE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>99</td>
<td>70.2%</td>
</tr>
<tr>
<td>No</td>
<td>42</td>
<td>29.8%</td>
</tr>
<tr>
<td>Missing</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td><strong>HISTORY OF DEPRESSION</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>42</td>
<td>31.6%</td>
</tr>
<tr>
<td>No</td>
<td>91</td>
<td>68.4%</td>
</tr>
<tr>
<td>Missing</td>
<td>8</td>
<td>5.7%</td>
</tr>
</tbody>
</table>

Note. History= reported being identified by a health provider as having depression

3. Description of glucose control and measured scales.

In this section a description of the results obtained from the glucose control and all the scales included in this study. A summary is included in Table 4. One hundred and thirty-eight HbA1C results were available for analyses. The HbA1C ranged from 4.0 to 15.9% with a mean of 7.8% (SD=1.9%). The mean score exceeds the national recommendation of ≤7.0%
established by the ADA (2010). The results were well distributed with four outlier scores representing HbA1C between 12.5 and 15.9%.

The depression symptoms score (BDI-II) distribution was positively skewed with the majority of participants (n=92, 65.2%) scoring in the minimal depression range which is a score of 0-13. Figure 2 shows the four groups of scores created to illustrate the results of all scores represented; depression symptoms score ≥ to 13 is considered a likely occurrence of clinical depression.

The results of the perceived stress scale (PSS) was in the mid range level of the scale, the higher the score the greater the perceived scale. The scores of the physical composite scale (PCS), which is addressed as physical function, were well distributed and results were above the norm base level of 50 which is considered to be in the positive range of health state (Ware & Kosinski, 2001).

The scores of the acculturation scale created a positive skewed distribution with majority of participants (n=60, 42.6%) reporting a score of zero which indicates that Spanish is the dominant language in this population. This information goes along with the finding that the majority of the participants in this study selected the questionnaires in Spanish.
Figure 3. Depression Symptoms (BDI-II) results (N=141)
<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Range</th>
<th>M(SD)</th>
<th>Median (SIR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HbA1C</td>
<td>138</td>
<td>4-15.9%</td>
<td>7.8% (1.93)</td>
<td>7.2%(1.85)</td>
</tr>
<tr>
<td>BDI-II</td>
<td>141</td>
<td>0-36</td>
<td>11.5 (5.7)</td>
<td>9(6.5)</td>
</tr>
<tr>
<td>Acculturation</td>
<td>141</td>
<td>0-20</td>
<td>4.9 (5.7)</td>
<td>2(4.7)</td>
</tr>
<tr>
<td>PSS</td>
<td>141</td>
<td>0-45</td>
<td>23.7 (7.9)</td>
<td>25(4.5)</td>
</tr>
<tr>
<td>PCS</td>
<td>139</td>
<td>5-100</td>
<td>56.17 (28.3)</td>
<td>60(25)</td>
</tr>
</tbody>
</table>

Note. HbA1C: glucose control level; SIR: Semi-interquartile range; BDI-II: Beck Depression Inventory Index-II; PSS: Perceived Stress Scale; PCS: Physical Health Scale.

4. **Inferential Statistics of demographic variables, health history and measured scales.**

Initial analysis was conducted to gain information on the relationship that gender has with all the participants’ demographic and health information listed in Table 2. A Chi-square test of independence was carried out. Statistical significance was identified only in the relationship between history of depression and gender ($\chi^2$ (df=1) = 7.129, $p<0.05$). This means that a history depression is related to the person’s gender, specifically female. Table 5 lists the results of the conducted analysis by gender. There was not a statistically significant result in having health insurance, insulin use, or whether they exercise. This means that the above variables were not related to the person’s gender.
Table 5. Relationship between gender and listed demographic and health variables by Pearson Chi-Square ($\chi^2$) analysis

<table>
<thead>
<tr>
<th>Variable</th>
<th>Gender</th>
<th></th>
<th></th>
<th></th>
<th>(\chi^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>(n)</td>
<td>(%)</td>
<td>Female</td>
<td>(n)</td>
</tr>
<tr>
<td>Health Insurance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td></td>
<td>44</td>
<td>89.8%</td>
<td>74</td>
<td>82.2%</td>
</tr>
<tr>
<td>No</td>
<td></td>
<td>5</td>
<td>10.2%</td>
<td>16</td>
<td>17.8%</td>
</tr>
<tr>
<td>Insulin Use</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td></td>
<td>19</td>
<td>40.4%</td>
<td>23</td>
<td>25.6%</td>
</tr>
<tr>
<td>No</td>
<td></td>
<td>28</td>
<td>59.6%</td>
<td>67</td>
<td>74.4%</td>
</tr>
<tr>
<td>Exercise</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td></td>
<td>38</td>
<td>77.6%</td>
<td>61</td>
<td>68.3%</td>
</tr>
<tr>
<td>No</td>
<td></td>
<td>11</td>
<td>22.4%</td>
<td>31</td>
<td>33.7%</td>
</tr>
<tr>
<td>History of Depression</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td></td>
<td>8</td>
<td>17%</td>
<td>34</td>
<td>39.5%</td>
</tr>
<tr>
<td>No</td>
<td></td>
<td>39</td>
<td>83%</td>
<td>52</td>
<td>60.5%</td>
</tr>
</tbody>
</table>

Note. *\(p<.05\)

Evaluation of the effect of demographic variables, years with type 2 diabetes, and the various questionnaires/scales completed by participants was carried out to gain further understanding of the effect on HbA1C and BDI-II scores which are the major variables of interest for this study. Pearson correlations were conducted to evaluate the relationship among these variables. The description of the included variables and the results are presented as a correlation matrix in Table 6 and description of statistically significant results are presented.

Age had significant negative correlation with years of formal schooling, PSS, acculturation score, and PCS. In this study sample, older persons had less years of formal education, less acculturation to U.S. culture, and lower physical health scores. Younger persons had higher perceived stress level scores. A positive correlation was noted between age and time with diabetes. A positive significant correlation was identified between age and years with type 2 diabetes; the older the person the longer they had had diabetes.

Education had a significant positive correlation with income; those reporting more years of formal education also reported higher income. Additional positive correlations with education
were perceived stress and acculturation. Greater years of schooling were related to higher perceived stress and acculturation scores.

The reported yearly household income had a significant positive correlation with acculturation and perceived stress; higher income was related to greater acculturation to U.S. culture and to higher perceived stress scores. Age had a significant negative correlation with yearly household income; the older the person was the lower the yearly household income.

The reported number of years with type 2 diabetes had a significant negative correlation with the physical health scale. Longer period of time with diabetes was related to having a physical health score lower than U.S. norm.

A significant positive correlation was identified between the BDI-II and Perceived Stress Scale (PSS) ($r=0.402, p<0.001$). In this group, as stress level increases the presence of depression symptoms increased. A significant negative correlation between depression symptoms (BDI-II) and the physical health component scale (PCS) of the SF-36v2 was identified ($r=-0.247, p<0.05$). This indicates that in this sample, higher score of depression symptoms are associated with lower physical health. The HbA1C did not correlate significantly with any other measured variables in this study.

The physical health scale (PCS) had a negative correlation with perceived stress level. The higher the level of stress reported the lower the score in physical health.
Table 6. Correlation Matrix of Participants’ Information and Scales’ Score

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Age</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Education</td>
<td>-.444*</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Income</td>
<td>-.308**</td>
<td>.446**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Years with type 2 diabetes</td>
<td>.278**</td>
<td>-.076</td>
<td>-.129</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. HbA1C</td>
<td>-.061</td>
<td>.154</td>
<td>-.117</td>
<td>.107</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. PSS</td>
<td>-.168*</td>
<td>.217*</td>
<td>.070</td>
<td>-.011</td>
<td>.043</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. BDI-II</td>
<td>-.127</td>
<td>.001</td>
<td>-.112</td>
<td>.072</td>
<td>.059</td>
<td>.492**</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Acculturation</td>
<td>-.403**</td>
<td>.740**</td>
<td>.523**</td>
<td>-.068</td>
<td>.088</td>
<td>-.213*</td>
<td>-.049</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>9. Physical Health</td>
<td>-.236</td>
<td>.164</td>
<td>.222*</td>
<td>-.201*</td>
<td>-.075</td>
<td>-.211*</td>
<td>-.247**</td>
<td>.170</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Note. HbA1C=long-term glucose control; PSS=Perceived Stress Scale; BDI-II= Beck Depression Inventory Index-II. *p<.05. **p<.01.

Further evaluation of HbA1C and BDI-II was carried out using an independent group t-test to determine if nominal variables such as gender, insulin use, and participants’ report of whether or not they exercise predict differences in HbA1C and BDI-II. The mean values indicate that those who use insulin have a higher HbA1C (M=9.033, SD= 2.229) than those not using insulin as part of diabetes treatment (M=7.268, SD= 1.530). Results indicate a statistically significant difference between insulin and non-insulin treatment samples in the HbA1C, t(df=132)=5.332, p<.001. The BDI-II did not differ significantly as a function of the variables evaluated.

The HbA1C results were further divided into two categories: controlled (4.2 to 6.9%) and uncontrolled (7.0 to 15.9%). The percentage of participants who had a controlled glucose was 37.7% (n=52). However, 62.2% (n=86) were in the uncontrolled level which places individuals at a greater risk for developing complication such as microvascular (renal and ophthalmic) disease, macrovascular (cardiovascular) disease, and neuropathies (loss of limbs). The recommended level for HbA1C is ≤ 7.0% (ADA, 2010).
Research Question Two: Does the method of diabetes medication treatment, oral agents vs. insulin administration, impact PSS score?

Information was obtained using the self-report method for participants to identify whether they were using insulin to control their glucose. A dichotomous (yes/no) response was recorded and analyzed as an independent variable along with the total score of the Perceived Stress Scale (PSS) as the dependent variable.

The statistical analysis conducted was an independent t-test to determine the mean difference in the total PSS score between the group of participants who reported insulin use and the ones who did not use insulin. Most participants reported taking oral medication to control their diabetes. Approximately one out of every three participants reported using insulin as part of diabetes treatment. The mean values indicate that the PSS score of those using insulin as part of their diabetes treatment ($M=23.17$, $SD=8.65$) was very similar to those not using insulin ($M=23.95$, $SD=7.69$). There was no statistically significant difference between these two groups ($t(135)=-.527$, $p=.599$).

Research Question Three: Is there a protective effect of acculturation on depression symptoms (BDI-II) after controlling for age, gender, education, and income?

Hierarchical multiple regression analysis was carried out to test the effect of acculturation on the respondent’s total depression symptoms score. Two-step analyses were carried out with BDI-II as a dependent variable and acculturation as the independent variable. Respondents’ demographic variables included in the model were age, gender, education, and reported yearly household income.

In the first step, the set of demographic variable is entered. In step two, acculturation was added to the list of demographic variables already included in step one. Results of step one
demonstrate that demographic variables accounted for 3.1% of the variance in depression symptoms. The addition of acculturation to the set of demographic variables in step two led to an $R^2$ change of $<1\%$. This reflects that adding acculturation did not add significance to the model as reflected by the $F$ change (.869). The results suggest that acculturation did not add more power to the predictor set than the demographic group. The addition of acculturation did not predict depression symptoms in this model. Table 7 describes the steps and equation model used for addressing this question.

Table 7. Summary of Hierarchical Multiple Regression Analysis for Predictors of Depression Symptoms (BDI-II) (N=141)

<table>
<thead>
<tr>
<th></th>
<th>$R^2$</th>
<th>$\Delta R^2$</th>
<th>$\Delta F$</th>
<th>Sig $\Delta F$</th>
<th>$\beta$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>.031</td>
<td>.031</td>
<td>.966</td>
<td>.429</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td>-.124</td>
<td>.227</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td>.046</td>
<td>.614</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
<td>.027</td>
<td>.805</td>
<td></td>
</tr>
<tr>
<td>Income</td>
<td></td>
<td></td>
<td></td>
<td>-.161</td>
<td>.116</td>
<td></td>
</tr>
<tr>
<td>Step 2</td>
<td>.032</td>
<td>.001</td>
<td>.027</td>
<td>.869</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td>-.126</td>
<td>.225</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td>.043</td>
<td>.646</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td></td>
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<td></td>
<td>.769</td>
<td>.769</td>
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</tr>
<tr>
<td>Income</td>
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<td>.148</td>
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</tr>
<tr>
<td>Acculturation</td>
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<td></td>
<td></td>
<td>-.025</td>
<td>.869</td>
<td></td>
</tr>
</tbody>
</table>

Research Question Four. What is the association between depression symptoms and long term glucose control?

Pearson correlation analysis was carried out to determine the association between these two continuous variables. There was no statistically significant correlation between depression symptoms and HbA1C level $r(136)=0.06$, $p=.490$. This means that no association was identified between participants’ depression symptoms score and the HbA1C levels.

Research Question Number Five. Do depression symptoms mediate the effect of Perceived Stress on HbA1C?
Because no main effect for depression symptoms on HbA1C was found, the BDI-II clearly does not act as a mediator in this case. Additionally, there was no effect for the PSS on HbA1C results. To address this question, a correlation was first carried out between BDI-II and HbA1C to determine statistical significance that would determine the mediation effect of PSS once included in the equation. There was no statistical significance identified between BDI-II and HbA1C \( r(136) = .059, p = .494 \). Correlation was further examined between HbA1C and Perceived Stress \( r(136) = .043, p = .616 \). The results in this study do not reflect a relationship between PSS score and HbA1C.

In this study, the long term glucose control does not seem to be related to depression symptoms score or perceived stress scores.

**Research Question Number Six. Is time with type 2 diabetes associated with depression symptoms, independent of history of depression and presence of other illnesses?**

A hierarchical multiple regression analysis was carried out between the dependent variable (BDI-II) and the independent variables which are components derived from the medical history: reported past history of depression, total illnesses in addition to diabetes, and number of years with type 2 diabetes. The total illness variable consisted of self-report of additional illness which included a total of nine conditions. Three steps were set up to determine a predictor model for depression symptoms based on the health history variables. Table 8 summarizes the description of the model and its results. Step one show that history of depression account for 8.2\% of the variance \( \left(R^2\right) \) in depression symptoms. Step two shows that when the participant’s additional illness is added to history of depression the variance in depression symptoms increased to 8.7\%. In step three the final health history, years with type 2 diabetes, was added and accounted for an increase of 8.8\% of the variance in depression symptoms. The model (step...
three) resulted in an $R^2$ change of .001. The standardized regression coefficient ($\beta$ weight) demonstrates that past history of depression was the independent variable that had the greatest influence in the prediction of depression symptoms severity (BDI-II scores) thus making the overall model statistically significant for predicting depression symptoms.

This same equation analysis was carried out with HbA1c as a dependent variable and no statistical significance was identified ($R^2=.01$, $p = .713$).

Table 8. Hierarchical Multiple Regression Analysis Predicting Depression Symptoms with Medical History Components (N=141)

<table>
<thead>
<tr>
<th>Step 1</th>
<th>$R$</th>
<th>$\Delta R^2$</th>
<th>$\Delta F$</th>
<th>Sig $\Delta F$</th>
<th>$\beta$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>.082**</td>
<td>.082</td>
<td>11.38</td>
<td>.001</td>
<td></td>
</tr>
<tr>
<td>History of Depression</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.287</td>
<td>.001</td>
</tr>
<tr>
<td>Step 2</td>
<td>.087**</td>
<td>.005</td>
<td>.656</td>
<td>.419</td>
<td></td>
<td></td>
</tr>
<tr>
<td>History of Depression</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.282</td>
<td>.001</td>
</tr>
<tr>
<td>Additional Illnesses</td>
<td></td>
<td>.042</td>
<td></td>
<td>.626</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 3</td>
<td>.088**</td>
<td>.001</td>
<td>.098</td>
<td>.754</td>
<td></td>
<td></td>
</tr>
<tr>
<td>History of Depression</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.254</td>
<td>.008</td>
</tr>
<tr>
<td>Additional Illnesses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.028</td>
<td>.754</td>
</tr>
<tr>
<td>Years with Diabetes</td>
<td></td>
<td>.070</td>
<td></td>
<td>.476</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**$p<.001$

Research Question Number Seven. What is the relationship between depression symptoms, glucose control, and physical function?

A standard multiple regression analysis was performed between the dependent variable, physical function (PF) as measured by the SF-36 v2, which is a scale used to measure quality of life, and the independent variables depression symptoms (BDI-II), and glucose control (HbA1C). Regression analysis revealed that the model was statistically significantly in predicting physical health ($p=.01$). Table 9 summarizes results of the variables included in the regression. The
results indicate that the depression symptoms score has more of an influence in the statistical model that predicts physical function scores, Beta weights ($\beta$) = -.240, $p$ = .005, than the glucose control as observed by the results of the analysis. In this population, the drafted model of depression symptoms score and the glucose control level are predictors for the person’s physical health score.

Table 9. Multiple Regression Analysis Predicting Physical Health (N=141)

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>SE B</th>
<th>$\beta$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>71.503</td>
<td>10.18</td>
<td></td>
<td>&lt;.01</td>
</tr>
<tr>
<td>BDI-II</td>
<td>-.732</td>
<td>.256</td>
<td>-.240</td>
<td>.005</td>
</tr>
<tr>
<td>HbA1C</td>
<td>-.889</td>
<td>1.228</td>
<td>-.061</td>
<td>.470</td>
</tr>
</tbody>
</table>

$R^2$=.063, $p$=<.05
CHAPTER 5

RESEARCH DISCUSSION

Results of this study and its implications for provision of health care for Mexican American individuals with type 2 diabetes are discussed in this chapter. Detailed discussion of the results is presented by research question.

Demographic characteristics

Research question one examined the demographic characteristics of all participants. The age range of this sample population was 18-86 years of age (Mean=62.4, $SIR=13.5$) creating a negatively skewed sample distribution. The presence of such high percentage of older persons posses an opportunity for comparing this study’s findings to the Hispanic Established Populations for the Epidemiological Studies of the Elderly (HEPESE) which is the largest retrospective study of older adult community residents representing all Southwest states that evaluated the health conditions and functioning of older adults (Black, 1999). The HEPESE study is where most information on the presence of diabetes and depression was obtained and published (Black, 1999; Black, Markides, & Ray, 2003). The mean age observed in this study is representative of the country’s prevalence of type 2 diabetes in the 60 years old or older group where 23.1% is estimated to have type 2 diabetes (CDC, 2007). Results of this study differ from the previously reported information of El Paso County with data collected in 2002 from the Behavioral Risk Factor Surveillance System (BRFSS). The mean age reported in that survey was 53.7 years old ($SD=2.1$) (Martinez & Bader, 2007).

The prevalence of older age may have accounted for “retired” employment status being the largest group represented in this research. Because a large portion of participants were older
and retired, they were also eligible for Medicare health care benefits and able to seek health care services from private family care clinics for their health care needs.

Women had a greater representation in this sample, 65.2\%, than men. The representation of women at a much greater scale than men supports the publication of Robinson (2007) which describing older women as a majority of the older population. Additionally, in general women are more likely to visit a health care provider (DHHS, 2007) than men. Majority of participants of studies included in the literature review had greater representation of females (Black et al., 2003; Egede & Zeng 2003; Lustman, 2000; Mier et al., 2008) which is similar to the findings of this study. The study by Pineda-Olvera et al. (2007) is one of the few prospective studies that evaluated presence of depression in a public health clinic setting. However, this study was exclusively in Hispanic women whose largest group was of Mexican descent. One of the most recent studies conducted along the U.S./Mexico border on Diabetes and Depression also had greater representation of females in U.S. and Mexico side (Mier et al., 2008).

The results of the education variable were interesting since the distribution was bimodal with sixth grade and twelve grade education reporting the highest frequency of completed education years. This leads to the conclusion that in this study there was a good representation of those that were and those that were not formally educated. However, the majority had less than high school education level. This group represented a less educated group in comparison to the rest of the El Paso County, Texas which reports a 65.8\% of residents 25 years of age and older having a high school education (U.S. Census, 2010). The factors that may have influenced the results in this study is the age of the participants along with the age of migration to U.S. which ranged from 1-65 years old (Median=24, $SIR=17$). In the HEPSE study, participants
were 75 years and older and large majority also migrated at a young age, formal education was reported as less than 6 years (Black et al., 2003).

The majority identified Mexico (64.7%) as their country of birth. Most participants elected to answer study questionnaires in Spanish (61%) and adaptation to U.S. culture levels as measured by the Acculturation Scale (Marin et al., 1987) was low (Median=2, $SIR=4.7$).

The median household income identified in this study (Median= 11,430, $SIR=5,206$) is much lower than the median of $38,779 for Hispanics in the U.S. (US Census Bureau, 2007) and also lower than the $36,519 reported for El Paso County in 2008 (US Census Bureau, 2010). A large portion of the population reported a “disabled” status when asked to identify employment status. This information along with the presence of a large number of older adults may have contributed further to the low income reported by this sample population. Because of the low income levels reported by participants, many (21%) also had Medicaid health services coverage to supplement Medicare coverage. This created a unique sample group that supports the reason for participants’ ability to select private family care clinic for provision of health services.

The personal information reported by participants’ parallels publications that describe Mexican Americans as having lower educational level and income compared to the rest of the US population (Livingston et al., 2008). Because the data collection was conducted in private clinics a large majority of participants had some type of health insurance, only 16% did not have health insurance as compared to the 36.2% Mexican Americans in the U.S. (Rhoades & Vistnes, 2006).

Participants’ Health History

The HbA1C mean for this sample was 7.8% exceeding the recommendation of $\leq6.5\% - 7.0\%$ (ADA, 2009; AACE, 2007); levels above 7.0% which equate to glucose 70-130
mg/dl have been found to increase diabetes complications (ADA, 2009). The wide span of time reported since diagnosed with diabetes, median of 8 years ($SIR=5.5$), and the HbA1C above the recommended levels places individuals at higher risk for diabetes complications (ADA, 2009). The Pineda-Olvera study did not provide HbA1C results which is the study that correlated glucose levels with depression symptoms. A recent study by Fisher, Glasgow, & Strycker, (2010) evaluated the relationship between diabetes distress and clinical depression with glycemic control in a longitudinal study. The reported HbA1C had a $M=7.2 \%$ ($SD=1.44\%$) and the number of additional illnesses with type 2 diabetes had a $M=3.9$ ($SD=2.5$). Results of this study demonstrate a higher HbA1C level and similar number of additional illnesses. The differences in the results between these studies are minimal which may point to similar patterns of participants included. The Pineda-Olvera et al. (2007), which included all Latino participants, reported less time with type 2 diabetes with a $M=7.64$ years ($SD=6.30$) and were a younger population with a $M=51.82$ years old ($SD=8.73$). The participants in the Mier et al. (2008) study conducted in a binational between U.S. and Mexico border populations reported a mean of 11 years ($SD=10$) with type 2 diabetes in those residing in the U.S.

The depression symptoms score measured by the BDI-II describes the possibility of clinical depression at four levels. Score of 0-13 is considered minimal depression symptoms score, 14-19 is described as mild, 20-28 is moderate, and scores of 29 or greater is severe level of depression symptoms score (Beck, Steer, & Brown, 1996). The depression symptoms score and the frequency obtained in this research included: sixty five percent of participants ($n=92$) scored in the minimal level of depression symptoms, 14.2% ($n=20$) in the mild range, 12.8% ($n=18$) in the moderate range, and 7.8% ($n=11$) in the severe range. Those participants whose score was in the moderate to severe range were referred to mental health services on the day of the interview.
The summative prevalence of depression symptoms from mild to severe is 34.8% which is higher than previous reported studies (Black, 1999; Black et al., 2003; Pineda-Olvera et al., 2007). In an exploratory study conducted in El Paso County colonias, individuals who self-reported having diabetes also reported a 20% prevalence of depression. This report was based on disclosure of having been told that they had depression. No screening tool was used to assess depression (Solis, Wiebe, & Anders, 2008). The possibility of a higher reported incidence of depression in the participants in this study may be due to following factors: lower socioeconomic status (SES), majority was female, and an older population group. The NIMH (2008) describes a higher prevalence of depression in Hispanic females and in elderly. Low education levels usually associated with lower income levels have been identified as risk factors for depression in Hispanics (NIMH, 2008; Shmaling & Hernandez, 2005).

The score of physical health scale of the SF-36v2 are norm based measures and participants in this study measured slightly above average, M=56.16 (SD= 28.3). Fifty is considered average according to U.S. Norm (Ware & Kosinski, 2001). Participants reported above average scores and differ from results of other published in other studies where Mexican Americans constituted a small portion of the population. Physical well-being of individuals with diabetes have been reported as decreased compared to non-diabetic individuals (Golden, Lazo, & Carnethon, 2008; Katon, 2008, Lee et al., 2009).

**Inferential Statistical Analyses**

**Chi-Square Analysis ($\chi^2$)**

The relationship identified during the Chi-square analysis between gender and history of depression is not a surprising finding. A greater prevalence of depression has been reported in females in the general population with rates doubled than men across ethnic groups (NIMH,
In the Mier et al. (2008) study of diabetic individuals with depression, a greater prevalence of depression among females was identified. The HEPES studies conducted in elderly Hispanic community residents also reported a higher prevalence of depression among female participants (Black et al., 2003; Gross et al., 2005; Sacco et al., 2007).

**Correlations**

The variables related to depression symptoms (BDI-II) were physical health (PCS) and perceived stress (PSS). Physical health declined with the presence of depression symptoms. This information is supported by other studies (Mier et al., 2008; Lee et al., 2009; Schneider, 2006) which acknowledge that physical state is affected by the presence of depression. One of the requirements for diabetes management is to maintain and, at times, augment physical activity to maintain glucose level as near normal as possible and to guard against diabetes complications (ADA, 2010). Thus the presence of depression symptom in individuals with type 2 diabetes may affect their adherence to exercise.

Higher depression symptoms score was correlated with PSS scores. Individuals with higher perceived stress scores are more likely to have a higher prevalence of depression symptoms. This finding supports the theory that stress level predisposes individuals to depression symptoms (Delahanty et al., 2007). The physical and emotional stress experienced by individuals with diabetes has been addressed in other studies as contributing factors to depression (Anderson et al., 2000; Black, 1999; Black et al., 2003; Golden, Lazo, Carnethon, 2008; Katon, 2008).

Education and perceived stress score achieved a positive correlation with statistical significance; this indicates that the higher the number of school years completed the higher stress level. These findings vary from some of the literature regarding social determinants of health.
According to Griffith & Villavicencio (1985) education has been recognized as a strong indicator of socioeconomic status measure and influences health behaviors. Consequently those of with higher education report better health state and in contrast, those with lower education report less health and stress has been seen as part of the health component (Finch, Kolody, & Vega, 2000). Ethnic minorities have reported a stress level higher than those not considered a minority (Griffith & Villavicencio, 1985).

However, in a similar study the correlation among education and stress was evaluated by Spencer et al. (2006) among Hispanics and African Americans with type 2 diabetes in the Detroit area; no statistically significant correlation was identified between the two variables. The authors identified that the limitation in that study may have been that the participants were a convenience sample from a health clinic that had full patient support.

It is possible that the findings of positive correlation between education and stress identified in this study may have had to do with the mid distribution range of the stress score as well as the reported years of education reported a bimodal effect. It creates an area for further exploration.

The lack of correlation identified in the HbA1C among the same variables, as those with the BDI-II, demonstrates a difference from previously published studies where a correlation had been identified between depression and glucose control (Pineda-Olvera et al., 2007; Gross et al., 2005; Lee et al., 2009). This may be that the HbA1C reported in those studies was obtained from the medical record. The HbA1C in those studies was obtained from 12 weeks to 6 months prior to data collection. In this study, the HbA1C serum test was obtained at the same visit of data collection.
Glucose control analysis

The HbA1C results were further analyzed to gain understanding of its role in this study since no statistically significant correlation was identified with the scales used in this study or with demographic characteristics of the participants.

The HgA1C level was found higher in individuals that reported using insulin as part of their diabetes management. This finding is unexpected as American Diabetes Association (2010) recommends insulin therapy administration as part of the medical treatment when diabetes is not controlled with oral medications in order to achieve the $\leq 7.0\%$ HgA1C (ADA, 2010). Therefore insulin is the most effective treatment for glucose control. A comparison of medication use pattern of the HEPSESE older adults from 1993-1994 and again in 2004-2005 conducted by Beard et al. (2010) demonstrates a decrease in insulin use from 21\% in 1993-1994 to 7.5\% in the 2004-2005. The reasons described for this change include a decrease of insulin use as the only method of treatment in 1993-1994 to taking two or more diabetes medications of newer classifications thus decreasing the need for insulin use. Information on number of medications being used to control glucose was not asked in this study and thus no explanation available to determine reasons for the obtained result in this study. The percentage of participants who use insulin to control glucose was 30.7\% (n=42) which means that approximately one out of every three persons with type 2 diabetes in this study uses insulin as part of their diabetes treatment. This was lower than the 36.4\% (n=20) reported in the study by Lee et al. (2009). There was no effect on BDI-II when comparing insulin and non-insulin users. This is similar to the findings by Lee et al. (2009) where depression was not related to any treatment modality.

The number of participants with uncontrolled type 2 diabetes (HbA1C $>7.0\%$) found in this study was higher than those found in the Lee et al. (2009). However, the participants in this
study were older and had been diagnosed with diabetes longer. This may account for the differences between these two studies. This also presents the possibility of diabetes complications increasing among participants in this study.

Glucose levels may be influenced by lack of sufficient financial resources to purchase non-covered medical treatment and also to have the resources for purchasing healthy foods. Glucose control is highly affected by adherence to prescribed treatment. In the HEPES study by Yong-Fong et al. (2003), 36% of participants were determined to be inconsistent with their treatment due to older age and no supplemental insurance to cover treatment. The presence of additional illnesses existing with type 2 diabetes may also affect the glucose level (ADA, 2010).

Research Question Two:

The stress level associated with the personal demand placed on individuals with type 2 diabetes was thought to be an underlying variable that contributes to depression in this population. In this study, the Perceived Stress Scale was used to evaluate whether stress level contributed to the depression symptom score. The results with this population negate the association between stress and depression symptoms which had been alluded to in other studies (Katon, 2008). The findings in this study also differ from those found in the study by Spencer et al. (2006). In that study, Hispanics were from the Detroit, Michigan area and the perceived stress was measured by two scales: the Cohen’s perceived stress scale- 4 item (PSS-4), and ten questions from an adapted scale from Hazzles and Uplifts. Spencer et al. (2006) found stress to be correlated with psychosocial components such as the person living alone, as well as with diabetes activities which was measured by the PAID (Problem Areas in Depression) which has been widely used in individuals with diabetes. The health history of participant’s was not included outside the self-report of diabetes and a retrospective review of the medical record to
identify the last HbA1C recorded within the past 12 months which was not found to contribute to stress score.

**Research Question Three:**

The effect of acculturation was evaluated as a protecting factor for depression symptoms. In this study, acculturation did not have any effect for predicting depression symptoms. The factors that may have contributed to this finding could be that the participants’ acculturation level reported was in the low range with scores ranging from 0-20 (Median= 2, $SIR= 2.7$). Spanish usage was the most common language identified by participants. Additionally, plurality of participants identified Mexico as their birth country and currently resides in a predominantly Mexican-American community in the U.S. where 73.3% of the population (U.S. Census, 2010) speaks a second language with Spanish being the most common. The factors mentioned create homogeneity in the sampled population and may have been a contributing factor for acculturation not having any predictive effect on depression symptoms.

Depression in Hispanics, which Mexican-Americans are considered a majority, has been identified to be more prevalent among individuals with greater acculturation level (NIMH, 2008). However a study conducted by González, Haan, & Hunter (2001) on the prevalence of depression in older Mexican Americans, based on acculturation level, and had different results than the information from NIMH (2008). In the study by González et al. (2001) participants who had a lower acculturation level reported a higher risk of depression as measured by the Center for Epidemiological Studies Depression Scale (CES-D). The authors measured acculturation by a more extensive questionnaire, 19 items, modified from the Acculturation Rating Scale of Mexican Americans (ARSM-A-II). Participants born in Mexico constituted 34% of the sampled population in the González et al. (2001).
The results obtained in this study and those by González, Haan, & Hunter, (2001) provide insight into the complexity of acculturation. It is a factor that would need to be evaluated in a more heterogeneous group to have a greater distribution of scores and gain variability to make appropriate recommendations.

**Research Question Four:**

There was no association identified between depression symptom score and glucose control level. The evaluation of these two variables was a major impetus for this study. However, because no statistically significant association was found among these two variables, it is likely that the reason for this outcome may be multi-factorial. Factors that need to be considered outside the two tested variables may be both personal and socio-economic characteristics that may protect or increase vulnerability to depression symptoms. This study did not support the previous studies (Lustman et al., 2000; Pineda-Olvera et al., 2007) where glucose levels were related to presence of depression. The presence of a support system to assist individuals with type 2 diabetes cope with this chronic illness has also been recognized as an important influence in glucose control and as a guarding off factor for depression symptoms in individuals with type 2 diabetes (Lustman et al., 2000), or existing co-morbidities. Greater depth of exploration of the phenomena of depression symptoms in individuals with type 2 diabetes and its effect on the psychological state of affected individuals needs to be considered.

A recent secondary analysis study by Rush et al. (2008) (N=1223) evaluated whether depression symptoms were related to being able to achieve nationally recommended glucose control levels. The reported glucose levels were obtained from a result within the year when data were collected. The depression symptoms score was obtained from the PHQ-2 screening for depression that asks the following two questions: 1) during the past month have you been
bothered by feeling down, depressed, or hopeless? 2) During the past month, have you often been bothered by little interest or pleasure in doing things? (Rush et al., 2008, p. 393)

The findings identified that individuals with greater prevalence of depression symptoms were less likely to be at the recommended glucose control level. The actual measurement of HbA1C at time of data collection provided a more timely actual glucose control result as compared to other studies where it was obtained from weeks to months prior to data collection (Pineda-Lover et al., 2007; Fisher et al., 2001). This may have been an added factor for not finding statistically significant results between depression symptoms and glucose control.

**Research Question Five:**

A question was drafted to evaluate whether depression symptoms mediate the effect of Perceived Stress Score on HbA1C. Stress level in individuals with DM has been described as a precursor to depression thus affecting metabolic function (Golden, 2007). The conceptual framework drafted for this study perceived stress was considered to be a factor that predisposed individuals with DM to depression symptoms and affected glucose control.

In this study, the lack of a significant relationship between depression symptoms score and glucose control stopped the continuation for evaluating BDI-II as a mediator of perceived stress and glucose control. Perceived stress did not have a statistically significant association with glucose control. The effect of perceived stress would need to be evaluated further to determine its association with depression symptoms and demographic characteristics of study participants. It is possible that the scale used to measure stress might not be sensitive enough for population such as the one included in this research. The PSS-14 item used in this study had been validated in Mexican population who were younger and with college education level. Because of the many self-care tasks that diabetic individuals have to carry out as part of disease
management, a stress scale that evaluated some of these factors might have been more sensitive. Such instrument to consider is the Problem Areas in Diabetes (PAID) by Polonsky, W.H., et al. (1995) which measures emotional stress related to diabetes.

**Research Question Six:**

Components of the medical history of participants demonstrated that the strongest predictor for depression symptoms in individuals with type 2 diabetes was past history of depression. This finding is significant for clinicians as the presence of depression influence the progression of chronic illness and leads to worsening of perceived health state and physical function (CDC, 2007; Black, Ray, & Markides, 1999). Additionally, all these factors increase the utilization of health care services.

Depression has been acknowledged to be a factor that increases the possibility for developing heart disease (NIH, 2010). Individuals with type 2 diabetes are also at increased risk for macrovascular complications which includes heart disease (ADA, 2010). Therefore individuals with DM2 who also have depression have an even greater incidence of heart disease. This information may be the basis for identifying a greater morbidity and mortality addressed by Lustman et al. (2000) in the study of Mexican American individuals with diabetes and depression.

The clinical significance of this finding is the need for proactive approach to treatment of individuals with type 2 diabetes. Clinicians need to probe into mental health history of individuals served and be vigilant of the reoccurrence of depression. Because type 2 diabetes is a chronic medical condition, efforts must be taken to prevent development of additional illnesses to lessen the risk of depression. The longer the person has diabetes the greater the possibility for
developing depression symptoms (Lustman, & Clouse, 2005). Clinicians must be alert to this information and screen for depression on a timely matter.

**Research Question Seven:**

The effect of depression symptoms and glucose control on physical function as measured by the PCS (Physical Composite Scale of the SF-36v2) was evaluated. This was drafted as a variable to measure a component of Quality of life. This study identified Glucose control (HbA1C) and depression symptoms (BDI-II) as predictors of physical function in a standard multiple regression analysis that was statistically significant. This information partially supports the drafted conceptual framework for this study as it had been drafted with physical function acting as bidirectional with depression and glucose control.

This finding supports previous study by Lee et al. (2009) where physical health summary scores were found to be worse on individuals with greater depression symptoms than those with less depression symptoms.

Individuals with diabetes, especially older adults, have a decline in physical function. In this study physical function did not affect glucose control but did have a relationship with depression symptoms. Even when glucose is not affected, quality of life of individuals with depression symptoms is affected with influence in physical function.

The implication for clinicians is that physical activity is part of diabetes management and may influence other physiological functions even when glucose is not directly affected. This study provides insight into the relevance for addressing depression symptoms screening and treat individuals with type 2 diabetes in a holistic manner to maintain a quality of life acceptable for the individual.
CHAPTER 6

CONCLUSIONS

The purpose of this study was to evaluate presence of depression symptoms and its relationship with glucose control. Although no statistical significance was found in the relationship between glucose controls (HbA1C) and depression symptoms (BDI-II), important information emerged as potential metabolic and psychological risks factors that this population may face due to their personal characteristics and health history.

In this study, the BDI-II played a major role in its relation to several variables. The BDI-II was found to be related to perceived stress and physical function. The medical history components evaluated were found to be related to BDI-II scores. There was no direct relationship, positive or negative, with demographic variables but the perceived stress scores were related to age, gender, education, and acculturation which creates a question as to whether stress may eventually play a role in the development of depression symptoms. The physical health score from the SF-36v2 were related to perceived stress score and affected by the combination of BDI-II and HbA1C. These findings demonstrate that individuals with diabetes have potential psychological conditions such as stress and depression that need to be addressed during the course of the disease. This is especially true because of the need to maintaining mobility, through regular exercise, is an essential component of the self-care management for type 2 diabetes.

This research provided significant information of a segment of the U.S. population that is highly affected by type 2 diabetes. Glucose control level based on HbA1C is considered the gold standard for identifying individuals with diabetes who may be at greater risk for developing complications of this metabolic condition. In this study, the majority of the participants had a
HbA1C greater than the 7.0% which classifies the diabetic state as “uncontrolled” creating a greater risk for disease of the eyes, kidneys, and peripheral nerves which limits sensation and has been linked to increased incidence of amputation of limbs (ADA, 2010). Cardiovascular disease such as myocardial infarction and peripheral arterial disease has been linked to uncontrolled HbA1C. The HbA1C was found to be higher among the group of individuals who use insulin as part of their diabetes management. Insulin is recommended when glucose level is not controlled with oral medications (ADA, 2010) and the findings were surprising as questions arise on the rationale for this result.

A possibility for the insulin use group having a higher HbA1C may be that patients do not follow prescribed therapy or may rely on insulin as the sole treatment for glucose control without taking into consideration the importance of dietary intake and adherence to physical activity. Other factors that may influence glucose control in individuals who use insulin may be the concomitant intake of certain medications to treat existing co-morbid conditions. Such medications may be corticosteroids used for inflammatory conditions and whose major adverse effect is an increase in glucose levels.

It would be expected that those on insulin would have better glucose levels. However, no information was available to the length of time with insulin, and additional factors that may influence glucose control in this population to justify and gain knowledge regarding the findings of this study.

The depression symptoms score as measured by BDI-II was a significant variable that was linked to many of the variables included in this research. Surprisingly, one out of three individuals included in this study reported scores greater than thirteen which is classified as mild to severe depression symptoms score. This result represents a higher level than in previous
studies. The identification of high presence of depression symptoms is significant in that the there is an increased risk for heart disease as documented by Lichtman et al. (2008) and possible increase in mortality (Zhang et al., 2005). Depression symptoms may also diminish the physical health of individuals affected and may interfere in the person’s physical activity which is a requirement for diabetes management and would ultimately affect glucose control. A positive relationship identified between depression symptoms and perceived stress in this group of diabetic individuals brings to light the need to prepare patients for possibility of its event.

The results derived from this study do not support the conceptual framework drafted for this study where HbA1C was depicted as the variable that would have been connected and ultimately affected by other variables in the study. The results reflect the depression symptoms (BDI-II) score being related to most study variables. This creates significant clinical implications in that the person needs to be evaluated not just by metabolic markers of disease state, such as measurement of HbA1C, but also by psychological means such as application of stress or depression screening questionnaires.

**Study Limitations**

Several limitations were identified in this research study. This was a convenience sample of individuals with type 2 diabetes who were recruited from various private clinics. Therefore, majority of the participants had some type of health insurance which increased greater accessibility to health care services. This created a selective group that may not reflect the Mexican-American population in the U.S. who is the largest group lacking health insurance in the U.S.

The self-report of type 2 diabetes and health history components is a limitation of this study. Self-report data collection method presents a threat to the validity of the measurements. It
is also possible that when participants are asked personal questions may answer according to what they believe is the socially acceptable answer.

The BDI-II is only a tool to detect depression symptoms and does not confirm a clinical diagnosis of depression. To confirm depression a clinical exam and additional evaluation to rule out underlying medical conditions would be necessary.

The physical health composite score (PCS) of the SF-36v2 is also a self-report. The summed scores make up the scale which may lack strength in fully determining the actual physical state of participants. The results are norm based to general U.S. population and may not capture actual physical health state.

The instrument selected for measuring perceived stress (PSS) has not been widely used in clinical settings and may not accurately measure the stress level in this population. Additionally, the population in this research study had a lower formal education and was older as compared to the population where this instrument has been used which was younger with greater formal education years (Cohen, Kamarck, & Mermelstein, 1983).

Further limitation is identified in the acculturation level of this population. The acculturation scores were low with a large percentage of participants identifying Spanish as their dominant language and reside in a predominantly Hispanic community. This created cultural homogeneity in the sample and likely led to the limited variability in the statistical distribution of this variable. The design of this study was a descriptive convenience sample and thus the acculturation level findings are not generalizable to all Mexican-American individuals with type 2 diabetes. The acculturation level identified in this study is a limitation factor because of its low acculturation scores.
Cheriboga et al. (2007) warns of the possibility that depression symptoms scales may not capture all components of clinical depression which may present in different manner according to the culture or level of acculturation.

A more comprehensive medical history such as information on the length of time with insulin use, insulin type, and the frequency or special considerations on the insulin administration may have provided greater insight into factors that contributed to the difference in the mean of HbA1C scores of those that used insulin and those who take oral medications for diabetes management.

The completion of all the questionnaires was lengthy and it is possible that participants’ fatigue may have altered responses. Each participant took approximately ninety minutes to complete the questionnaires and to have their serum blood test drawn.

Since this study was conducted in private family practice clinics, participants may have felt pressured to participate to please their health care providers. Since the majority of participants preferred to complete questionnaires in Spanish and they were also approached in their preferred language, it is possible that this influenced their decision to be in the study and their answers to not be contradictory.

The statistical analyses conducted were guided by the research questions prepared to answer the purpose for this study and this may be viewed as a limitation for this research study. It is possible that greater depth and sophistication of statistical analyses of the variables included in this study may yield different results that may significant information about Mexican-American individuals with type 2 diabetes.
Implications for practice

The emergence of such high rate of depression symptoms along with its connection with perceived stress score calls attention for the need to address the psychological state of individuals with type 2 diabetes. Additionally, the large percentage of participants with uncontrolled type 2 diabetes is alarming. Health care practitioners need to seek out evidence based methods for assisting individuals with type 2 diabetes to control glucose levels and lessen the risk of diabetes related complications. Attending to traditional medical appointments may not suffice to assist in the metabolic and psychological demands of type 2 diabetes.

The complexity of management of individuals with type 2 diabetes is evident in this study as the person should not be treated solely on results of a metabolic exam but rather as an entire person taking into consideration the personal characteristics and psychosocial profile of the individual. Primary health care providers need to step away from the medication centered approach and consider an interdisciplinary team approach for management of patients with type 2 diabetes. Perhaps consideration needs to be given to preparing diabetic individuals to the psychological events that the chronic condition may cause and create interventions for prevention of occurrence.

The high number of participants with HbA1C >7.0% alerts health care providers of the need to probe further into the possible causes for this occurrence. Adherence to treatment has been often addressed but exploration into its causation and intervention studies to improve outcomes need to be considered. A proactive approach is necessary with open communication with the patients and evaluation of social and environmental factors that may keep them from achieving normal glucose control levels.
Arrays of health care providers are presented with an opportunity for impacting health care services by providing a holistic approach to patient care. The HbA1C is not the only factor for evaluation during a medical visit but only a small measurable physiologic component of potential risks for type 2 diabetes outcomes. The psychological evaluation needs to be incorporated in the management to improve quality of life of type 2 diabetes patients.

Policy changes at the national and state level need to take place to improve access and reimbursement for mental health services at the community level. The effectiveness of nurse case managers as part of the team care approach for depression may improve access to psychological services possibly at a lesser cost. Primary care providers and consultants such as trained Counselors and Nurses have been shown to be effective when working as a team in managing individuals with depression (Gilbody et al., 2003). Utilization of trained counselors, nurses, and social workers may assist in providing appropriate interventions to lessen stress and minimize depression symptoms in type 2 diabetes. Instead of focusing in a pharmacological treatment approach only; a comprehensive treatment is required to improve patient outcomes.

Because of the complexity of diabetes and the importance of self-management, individuals affected need to be empowered through education and provision of community and health care practitioner’s support to influence diabetes control and ultimately to prevent complications. Health care practitioners need to be vigilant of possible factors that may hinder the outcome of diabetes care and work with support health and community services to minimize barriers to success of treatment.

The presence of depression in individuals with diabetes has been widely documented (Black & Markides, 1999; Lustman et al., 2000). This study supported previous findings with BDI-II scores showing moderate to severe depression symptom score (Lustman & Clouse, 2005).
Physical health as measured by the SF-36v2 had a significant correlation with depression. This is important because part of diabetes management is maintaining physical activity on a regular basis to improve glucose control. When a person is depressed the probability of exercising diminishes does creating a potential effect in glucose control and ultimately augmenting potential diabetes complications. Additionally as the U.S. population ages, a greater incidence of type 2 diabetes is likely to occur and physical abilities related to aging may occur as demonstrated by this study, where age was related to a decrease in physical function.

**Future Research**

A great opportunity for future research has surfaced with the results of this study. Studies may be designed in the following areas: 1) assisting clinicians in recognizing the need to evaluate for depression in patients with type 2 diabetes to initiate treatment, 2) interventions for improving glucose control in Mexican- Americans and elderly, 3) interdisciplinary approach to care of type 2 diabetes patients outside the medical model approach.

Health care practitioners need to consider ways to assist clinicians in detecting depression symptoms in a timely manner with minimum requirement of time. The primary care doctors in El Paso County are limited; the ratio of population per direct patient care physician is 905 patients to one primary care doctor (TDSHS, 2009). Time constraints are often verbalized by clinicians as reason for not screening for depression symptoms on regular bases. The limited number of primary care doctors creates a burden in actual time available for patient care.

The idea of a brief depression screening method has been explored and may provide an opportunity for further evaluation in this population. The development of two questions, extracted from most validated depression scales are being considered. The questions are related to “depressed mood and low interest” (Mitchel, 2008, p.1936). Comparison studies on sensitivity
and specificity for using the one and two questions as possible depression screening in cancer patients are being evaluated (Mitchel & Coyne, 2007) have been exploring the possibility of using ultra-short screening instruments to improve the probing of mood disorders since primary care physicians may be overlooking the presence of this condition. The possibility of using these two questions may help identify clinical depression. The use of the two questions for depression symptoms finding in a medical practice was suggested by Whooley & Simon (2000), the two questions included were “During the past month, have you often been bothered by (1) feeling down, depressed, or hopeless, and (2) having little interest or pleasure in doing things?” (p.1943). A positive answer to these questions would suggest further evaluation for clinical depression.

Application of intervention of diabetes treatment programs that have shown to be successful in improving HbA1C in other areas may be considered. Programs such as Project Dulce initiated in San Diego, CA where nurse diabetes educators manage the care of diabetic individuals under the direction of a physician, and community health workers (promotoras) are the patient’s peer educators. The population served in this program are individuals with type 2 diabetes of diverse ethnic backgrounds, of low income, who are uninsured or underinsured (Philis-Tsimikas et al., 2004). Development of an intervention study with components deemed successful in Project Dulce is a feasible research opportunity for improving glucose control in individuals affected by type 2 diabetes residing in the El Paso, Texas region.

Institutions of higher education in El Paso area are in a perfect setting for designing intervention studies using an interdisciplinary team approach of care for individuals with diabetes. The professional disciplines for possible inclusion in a holistic care approach to individuals with diabetes are: Advanced Practice Nurses, Social Workers, Occupational and
Physical Therapist, and Psychology Counselors. All of these professionals are available in the El Paso, Texas region.

A great need exists for health care professionals to think and practice beyond the current conventional medical treatment in order to positively impact the lives of those affected by type 2 diabetes independent of age and ethnic orientation.
LIST OF REFERENCES


Martinez, N. C., Bader, J. (2007). Analysis of behavioral risk factor surveillance system data to assess the health of Hispanic Americans with diabetes in El Paso County, Texas


APPENDICES

Appendix A: Permission for Recruitment of Study Participants
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APENDIX A

PERMISSION FOR RECRUITMENT OF STUDY PARTICIPANTS

Participant identifier ____________        Interviewer_________________ Date___________

Date: ___________________

Dr. _Name_________

Address:

Dr._______________

I am conducting a research study to evaluate the association of diabetes with depression and its effect on glucose control and physical function. This study has been approved by the UTEP’s Institutional Review Board and is part of my Doctorate Dissertation. The information gained will assist clinicians in understanding the association between diabetes and depression and design interventions to lessen potential complications and improve patient outcomes.

I am asking for permission to approach your patients during their scheduled appointment, while waiting in the waiting room, to see if they would be willing to participate in this study. The study consists of completion of several questionnaires, including a depression scale, and a blood sample will be drawn for a HbA1c. I will adhere to HIPAA regulations and maintain patient confidentiality at all times. Your patient will bring you results of the A1C upon completion of the study. I will inform you of any problems or concerns identified during the study. The time for recruitment and the data collection will be approximately from October to December, 2009.

The proposal of this study is available for your review. Please feel free to contact my faculty advisor Dr. R. Anders, Dean of School of Nursing at 915-747-8217. Thank you in advance.

Respectfully,

Guillermina Solis, RN, NP-C, Ph.D.(c)
College of Health Science
University Texas El Paso
1101 N. Campbell
El Paso, TX  79902
APENDIX B

RECRUITMENT OF PARTICIPANTS

Please circle your answer

“I am doing a research study about people with Diabetes to learn more about this illness and to help those affected”

Would you let me to talk to you about the study? YES NO

Por favor marque su respuesta

“Estoy haciendo un estudio con personas afectadas por Diabetes para saber más de esta enfermedad y ayudar a los que la tienen”

Me permite platicar con usted de este estudio? SI NO
Protocol Title: The Coexistence of Diabetes Mellitus Type 2 and Depression symptoms in Mexican American Adults: Its effect on glucose control and physical function

Principal Investigator: Guillermina Solis, RN, NP-C, Ph.D.(c).
Main Advisor: Robert L. Anders, DrPH, APRN, CNNA, FAAN,

UTEP: College of Health Science

Introduction
You are being asked to take part voluntarily in the research project described below. Please take your time making a decision and feel free to discuss it with your friends and family. Before agreeing to take part in this research study, it is important that you read the consent form that describes the study. Please ask the study researcher or the study staff to explain any words or information that you do not clearly understand.

Why is this study being one?
You have been asked to take part in a research study of people with diabetes to learn more about persons with diabetes, see whether they have depression symptoms, and how this may affect the sugar level and the body.

Approximately, 140 people will be enrolling in this study to take place in El Paso, Texas. About five Health Care clinics will participate with approximately 28 people from each.

You are being asked to be in the study because you are over the age of 18 and have identified yourself as having Diabetes.

If you decide to enroll in this study, your total involvement will last two weeks.

What is involved in the study?
If you agree to take part in this study, the research team will:

- Explain the study
- Check to see if you are able to be in the study
- Have you complete five questionnaires about yourself given by the researcher or research assistant
- Take a blood sample to check your average blood sugar, this will be done by a nurse or laboratory person
- All this will be done in your Doctor’s office either before or after seeing your Doctor
- Take about 1.5 hours
- Only your blood results will be given to your Doctor about 10 days later.
What are the risks and discomforts of the study?
There are no known risks associated with this research. However, you may become tired, nervous or sad. You may have the following when your blood is taken: discomfort, pain, or bruise. In rare event, infection from the needle stick may occur.

What will happen if I am injured in this study?
The University of Texas at El Paso and its affiliates do not offer to pay for or cover the cost of medical treatment for research related illness or injury. No funds have been set aside to pay or reimburse you in the event of such injury or illness. You will not give up any of your legal rights by signing this consent form. You should report any such injury to Guillermina Solis @ 915-630-3136 and to the UTEP Institutional Review Board (IRB) at (915-747-8841) or irb.orsp@utep.edu.

Are there benefits to taking part in this study?
There will be no direct benefits to you for taking part in this study. This research may help health professionals understand the psychological state of persons with diabetes and how this may affect your sugar level and the body.

What other options are there?
You have the option not to take part in this study. There will be no penalties involved if you choose not to take part in this study.

Who is paying for this study?
Internal Funding: Funding for this study is provided by a grant from UTEP Department of Hispanic Health Disparities Research Center.

What are my costs?
There are no direct costs. You will be responsible for travel to and from the research site and any other incidental expenses.

Will I be paid to participate in this study?
You will be given a $15.00 gift card for your participation at the end of this study

What if I want to withdraw, or am asked to withdraw from this study?
Taking part in this study is voluntary. You have the right to choose not to take part in this study. If you do not take part in the study, there will be no penalty.

If you choose to take part, you have the right to stop at any time. However, we encourage you to talk to a member of the research group so that they know why you are leaving the study. If there are any new findings during the study that may affect whether you want to continue to take part, you will be told about them.

The researcher may decide to stop your participation without your permission, if he or she thinks that being in the study may cause you harm, if you are not able to complete the questionnaires, or if not able to have your blood test done.
Who do I call if I have questions or problems?
You may ask any questions you have now. If you have questions later, you may call: Guillermina Solis@ 915-630-3136, gsolis2@utep.edu.

If you have questions or concerns about your participation as a research subject, please contact the UTEP Institutional Review Board (IRB) at (915-747-8841) or irb.orsp@utep.edu.

What about confidentiality?
1. Your part in this study is confidential. None of the information will identify you by name. All records will be kept in a locked cabinet in UTEP’s College of Health Science and only Ms. Solis and her advisor will have access to the information.

2. The results of this research study may be presented at meetings or in publications; however, your identity will not be disclosed in those presentations.

Mandatory reporting
If during the study, information is revealed about potentially dangerous future behavior towards you or others, the law requires that this information be reported to the proper authorities.

Authorization Statement
I have read each page of this paper about the study (or it was read to me). I know that being in this study is voluntary and I choose to be in this study. I know I can stop being in this study without penalty. I will get a copy of this consent form now and can get information on results of the study later if I wish.

Participant Name: _________________________________ Date: ____________

Participant Signature: ________________________________ Time: ____________

Consent form explained/witnessed by: ______________________________

__________________________
Signature

Printed name: ______________________________

Date: ____________ Time: ____________
APENDIX D

SPANISH INFORMED CONSENT

La Universidad de Tejas en El Paso (UTEP) Comité Examinador Institucional
Forma Informada del Consentimiento para la Investigación que Incluye Seres Humanos

Título del protocolo: La coexistencia de Diabetes Melitos Tipo 2 y los síntomas de depresión en adultos Mexicanos-Americanos: Su efecto sobre el control de glucosa y la función física

Investigador principal: Guillermina Solis, RN, NP-C, Ph.D. (c)
   Consejero principal: Robert L. Anders, DrPH, APRN, CNNA, FAAN

UTEP: Colegio de Ciencias de Salud

Introducción
Le están pidiendo participar voluntariamente en el proyecto de investigación descrito. Tómese su tiempo para llegar a una decisión y síntase libre de hablar con sus amigos y familia acerca de esto. Antes de acordar participar en este estudio de investigación, es importante que usted lea la forma del consentimiento que describe el estudio. Pida por favor que el investigador del estudio o su personal le expliquen cualesquier palabra o información que no entienda claramente.

¿Por qué se está haciendo este estudio?
Le han pedido participar en un estudio de la investigación de gente con diabetes para aprender más sobre personas con diabetes, ver si tienen síntomas de la depresión, y cómo éste puede afectar el nivel del azúcar y el cuerpo. Aproximadamente 140 personas estarán en este estudio en El Paso, Tejas. Cerca de cinco clínicas del cuidado médico participarán con aproximadamente 28 personas de cada una. Le están pidiendo estar en el estudio porque usted está sobre la edad de 18 años y ha identificado que tiene diabetes. Si usted decide participar en este estudio, su participación total durará dos semanas.

¿Qué está incluido en el estudio?
Si usted está de acuerdo en participar en este estudio, el equipo de investigación hará lo siguiente:
• Explicarle el estudio
• Revisar si puede usted estar en el estudio
• El investigador o su asistente se lo darán que complete cinco cuestionarios acerca de usted
• Le tomarán una muestra de la sangre para comprobar su promedio de azúcar, esto será hecho por una enfermera o por la persona del laboratorio
• Todo esto se hará en la oficina de su doctor ya sea antes o después de ver a su doctor
• El proceso durará cerca de 1.5 horas
• Solamente sus resultados de la sangre serán dados a su doctor cerca de 10 días después
¿Cuáles son los riesgos y los malestares del estudio?
No hay riesgos que nosotros sepamos asociados a esta investigación sin embargo, usted se puede cansarse, se puede poner nervioso o triste. Cuando le tomen la sangre usted puede tener lo siguiente: malestar, dolor, o moretón. En acontecimiento raro, puede tener infección debido a la aguja cuando le saquen sangre.

¿Qué sucederá si me dañan en este estudio?
La Universidad de Tejas en El Paso y sus afiliados no ofrecen pagar ni cubrir el coste del tratamiento médico para la enfermedad o lesión relacionada con la investigación. No se ha preparado ningún fondo para pago o reembolso en caso de lesiones o enfermedades. Usted no cedará cualquiera de sus derechos legales firmando esta forma de consentimiento. Usted debe reportar cualquier lesión a Guillermina Solís al 915-630-3136 y al comité examinador institucional de UTEP (IRB) al 915-747-8841 o irb.orsp@utep.edu.

¿Hay ventajas al participar en este estudio?
No habrá ventajas directas para participar en este estudio. Esta investigación puede ayudar a profesionales de salud a entender el estado psicológico de las personas con diabetes y aprender cómo ésta puede afectar el nivel del azúcar y al cuerpo.

¿Cuáles son mis opciones?
Usted tiene la opción a no participar en este estudio. No habrá ningún castigo o repercusiones si usted decide no participar en este estudio.

¿Quién está pagando por este estudio?
Financiamiento interno: El financiamiento para este estudio es proporcionado por una concesión del departamento de UTEP del Centro de Investigación de las Disparidades de Salud en los Latinos.

¿Cuáles son mis costos?
No hay costos directos. Usted será responsable por llegar al sitio donde se conducirá la investigación y por cualquier otro costo fuera del estudio.

¿Me pagarán para participar en este estudio?
Al final del estudio se le obsequiara una tarjeta de $15.00 por su participación que puede ser canjeada en ciertas tiendas locales.

¿Qué si quiero retirarme, o me piden retirarme de este estudio?
Su participación en este estudio es voluntaria. Usted tiene derecho a elegir no participar en este estudio. Si usted no participa en el estudio, no habrá ningún castigo. Si usted elige participar, tiene derecho de retirarse del estudio en cualquier momento. Sin embargo, le animamos a que hable con un miembro del grupo de investigación para saber porqué usted está dejando el estudio. Si hay algunos nuevos detalles durante el estudio que pueden afectar su decisión de participación, se le harán saber. El investigador puede pedirle que se retire del estudio sin su permiso si él o ella piensan alguno de los siguientes: que el estar en el estudio puede hacerle daño, si no puede terminar los cuestionarios, o si no es posible obtener su análisis de sangre.
¿A quién llamo si tengo preguntas o problemas?
Usted puede hacer cualquier pregunta que tenga ahora. Si usted tiene preguntas más adelante, puede llamar a: Guillermina Solís al 915-630-3136, o correo electrónico gsolis2@utep.edu. Si usted tiene preguntas o preocupaciones acerca de ser participante de investigación, por favor contacte al comité examinador institucional de UTEP (IRB) por teléfono al 915-747-8841, o por correo electrónico al irb.orsp@utep.edu.

¿Cómo se mantendrá confidencialidad (secreto)?
1. Su participación en este estudio es confidencial. Ninguna de la información le identificará por nombre. Todos los expedientes serán mantenidos en un gabinete seguro en la Universidad de UTEP departamento de Ciencias de Salud. Únicamente La Sra. Solís y su consejero tendrán acceso a la información.

2. Los resultados de este estudio de investigación puede que se presenten o se publiquen en campos profesionales; sin embargo, su identidad no será divulgada en esas presentaciones.

Reporte obligatorio
Si durante el estudio, se revela información sobre comportamiento futuro potencialmente peligroso hacia usted o otros, la ley requiere que esta información esté divulgada a las autoridades apropiadas.

Declaración de autorización
He leído cada página de este documento sobre el estudio (o se me leyó). Sé que el participar en este estudio es voluntario y elijo estar en este estudio. Sé que puedo dejar de estar en este estudio sin castigo. Se me dará copia de esta forma de consentimiento y si deseo puedo conseguir la información sobre los resultados del estudio más adelante.

Nombre del participante: _______________________  Fecha: ______________
Firma del participante: _______________________  Hora: ______________
Forma del consentimiento explicada por/atestiguada por: _________________________
Firma
Nombre impreso de firma: _________________________
Fecha: ______________  Hora: ______________
Dear Colleague

Your patient has participated in a research study on diabetes and depression. As part of the study, a venous blood sample was taken to evaluate the HgA1C.

Please feel free to contact me at (915) 630-3136, if you have any questions.

Respectfully,

Guillermina Solis, RN, MS, NP-C, Ph.D. (c)
College of Health Science & School of Nursing
University Texas El Paso
1101 N. Campbell
El Paso, TX 79902
APENDIX F
NOTIFICATION OF HBA1C RESULTS

Participant identifier ____________ Interviewer_________________ Date___________

Date___________

Dear Colleague,

Your patient, _________________ participated in a research study on the Association of Diabetes type 2 and Depression symptoms in Mexican American Adults on __________ (date blood test done). As part of the study, the HbA1C was checked and the result was________%. I have advised the participant to follow up with you for further evaluation.

Feel free to contact me if any questions or problems arise. My telephone number is 630-3136.

Respectfully,

Guillermina Solis, RN, NP-C, PhD(c)
College of Health Science & School of Nursing
University Texas at El Paso
1101 N. Campbell
El Paso, TX 79902
APENDIX G

DEMOGRAPHIC AND HEALTH QUESTIONNAIRE
DIABETES AND DEPRESSIVE SYMPTOMS
AND ITS EFFECT ON GLUCOSE LEVEL

Participant identifier ____________ Interviewer_________________ Date___________

1. What is your age? _________
2. What is your sex? ( )Male ( )Female
3. What is your country of birth? ______________
4. If born in other country, how old were you? _________
5. What is your father’s country of birth? ______________
6. What is your mother’s country of birth? ______________
7. What is your grandfather’s country of birth? ______________
8. What is your grandmother’s country of birth? ______________
9. What is your ethnicity? ( )Mexican-American ( )Mexican National
10. What is your main language at home? ( )English ( )Spanish
11. What is your marital status? ( )single ( )married ( )separated/divorced ( )other______
12. What is your highest finished school grade? _________
13. Which is your employment status? ( )full time ( )part time ( )retired
   ( )unemployed ( )housewife ( )disabled
14. If you work outside your home, what type of work do you do? _______________
15. What is your approximate family income? ________________ ( )year ( )month ( )week
16. Do you have Health Insurance? ( )Yes ( )No If yes, what kind? ( )Private
   ( )Medicare ( )Medicaid
17. Do you exercise, like walking or other? ( )Yes ( )No
18. If yes, how many times a week? _________ How much time? _________

Medical History:
How long have you had diabetes? _______
Do you take medicines for your diabetes? ( )Yes ( )No
Do you inject Insulin for your diabetes? ( )Yes ( )No
What medicines do you take for diabetes?

______________________________________________________________

What other medicines do you take? Include medicines without prescription:

______________________________________________________________

Have you ever been told by a healthcare provider (such as a doctor or nurse) that you have or have had any of the following health problems (check yes or no).

<table>
<thead>
<tr>
<th>Health Problem</th>
<th>( ) Yes</th>
<th>( ) No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arthritis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depression</td>
<td>( ) Yes</td>
<td>( ) No</td>
</tr>
<tr>
<td>High Blood Pressure</td>
<td>( ) Yes</td>
<td>( ) No</td>
</tr>
<tr>
<td>High Cholesterol</td>
<td>( ) Yes</td>
<td>( ) No</td>
</tr>
<tr>
<td>Heart disease</td>
<td>( ) Yes</td>
<td>( ) No</td>
</tr>
<tr>
<td>Heart attack</td>
<td>( ) Yes</td>
<td>( ) No</td>
</tr>
<tr>
<td>Kidney disease</td>
<td>( ) Yes</td>
<td>( ) No</td>
</tr>
<tr>
<td>Poor circulation</td>
<td>( ) Yes</td>
<td>( ) No</td>
</tr>
<tr>
<td>Stroke</td>
<td>( ) Yes</td>
<td>( ) No</td>
</tr>
<tr>
<td>Other: ____________________________</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APENDIX H

EL EFECTO EN LA GLUCOSA DE PERSONAS CON DIABETES Y SÍNTOMAS DE DEPRESIÓN
CUESTIONARIO DEMOGRÁFICO Y DE SALUD

Participant identifier ____________        Interviewer_________________ Date___________

1. ¿Que edad tiene? _______
2. ¿Cual es su sexo?  ( )Masculino ( )Femenino
3. ¿En que país nació usted? ______________ 
4. Si nació fuera de Estados Unidos, ¿que edad tenía cuando llego? ________
5. ¿En que país nació su padre? ______________
6. ¿En qué país nació su madre? ______________
7. ¿En qué país nació su abuelo? ______________
8. ¿En qué país nación su abuela?_____________
9. ¿Como se considera usted? (   )México-Americana (   ) Mexicana
10. ¿Que idioma habla en su casa? (   ) Ingles (   ) Español
11. ¿Cual es su estado civil?  (   ) soltera (   ) casado(a) (   ) separado(a)/divorciado(a) (   ) otro________
12. ¿Hasta que año estudio? ___________
13. ¿Trabaja usted? (   ) tiempo completo (   ) medio tiempo (   ) jubilado(a) (   ) desempleado(a) (   ) ama de casa (   ) deshabilitado
14. Si trabaja fuera de su casa, ¿que tipo de trabajo tiene? ______________
15. ¿Cual es el ingreso familiar aproximado?_________(   ) por ano (   ) por mes (   ) por semana
16. ¿Tiene usted aseguranza para servicios médicos?  (   )Si (   )No
   ¿Cual tipo tiene? (   ) Privada (   ) Medicare (   ) Medicaid
17. Acostumbra hacer ejercicio, ¿como caminando u otro tipo? (   )Si (   ) No
18. Si hace ejercicio, ¿cuantas  veces a la semana? _____Cuanto tiempo?_____

Historia Médica:
1. ¿Cuanto tiempo tiene con diabetes? ________años
2. ¿Toma medicinas para su diabetes? (   ) Si (   )No
3. ¿Se inyecta Insulina para su diabetes? (   ) Si (   )No
4. ¿Qué medicinas toma para su diabetes?

___________________________________________________________________________

5. ¿Qué otras medicinas toma? Por favor incluya las que compra sin receta?

___________________________________________________________________________

6. ¿Alguna vez le ha dicho su proveedora de salud (doctor o enfermera) que tiene alguna de estas enfermedades?

Artritis ( ) Si ( ) No
Depresión ( ) Si ( ) No
Alta Presión Arterial ( ) Si ( ) No
Colesterol Alto ( ) Si ( ) No
Enfermedad del corazón ( ) Si ( ) No
Infarto ( ) Si ( ) No
Embolio ( ) Si ( ) No
Enfermedad de riñones ( ) Si ( ) No
Mala Circulación ( ) Si ( ) No
Otros: ____________
APENDIX I

PERCEIVED STRESS SCALE SCORING**

Instructions: The questions in this scale ask you about your feelings and thoughts during the last month. In each case, please mark with a check how often you felt or thought a certain way.

1. In the last month, how often have you been upset because of something that happened unexpectedly?
   ___ 0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often

2. In the last month, how often have you felt that you were unable to control the important things in your life?
   ___ 0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often

3. In the last month, how often have you felt nervous and "stressed"?
   ___ 0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often

4*. In the last month, how often have you felt confident about your ability to handle your personal problems?
   ___ 0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often

5*. In the last month, how often have you felt that things were going your way?
   ___ 0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often

6*. In the last month, how often have you found that you could not cope with all the things that you had to do?
   ___ 0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often

7*. In the last month, how often have you been able to control irritations in your life?
   ___ 0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often

8. In the last month, how often have you felt that you were on top of things?
   ___ 0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often

9*. In the last month, how often have you been angered because of things that were outside of your control?
   ___ 0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often

10*. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?
   ___ 0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often
11. In the last month, how often have you been angered because things that happened that were outside of your control?
___0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often

12. In the last month, how often have you found yourself thinking about things that you have to accomplish?
___0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often

13*. In the last month, how often have you been able to control the way you spend your time?
___0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often

14. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?
___0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often


*Scored in these items are reversed; higher scores represent higher perceived stress.

**TOTAL SCORE **

________________
APENDIX J

ADAPTATION OF THE PSS (14 ITEMS) FOR MEXICO [IN SPANISH]

Instrucciones: Marca la opción que mejor se adecue a tu situación actual, teniendo en cuenta el último mes.

1. ¿Con que frecuencia has estado afectad/a por algo que ha ocurrido inesperadamente?
   ___0=Nunca ___1=Casi nunca ___2=De vez en cuando ___3=A menudo ___4=Muy a menudo

2. ¿Con que frecuencia te has sentido incapaz de control las cosas importantes de tu vida?
   ___0=Nunca ___1=Casi nunca ___2=De vez en cuando ___3=A menudo ___4=Muy a menudo

3. ¿Con que frecuencia te has sentido nervioso/a o estresado/a (lleno de tensión)?
   ___0=Nunca ___1=Casi nunca ___2=De vez en cuando ___3=A menudo ___4=Muy a menudo

4. ¿Con que frecuencia has manejado con éxito los pequeños problemas irritantes de la vida?
   ___0=Nunca ___1=Casi nunca ___2=De vez en cuando ___3=A menudo ___4=Muy a menudo

5. ¿Con que frecuencia has sentido que has afrontado efectivamente los cambios importantes que han estado ocurriendo en tu vida?
   ___0=Nunca ___1=Casi nunca ___2=De vez en cuando ___3=A menudo ___4=Muy a menudo

6. ¿Con que frecuencia has estado seguro/a sobre tu capacidad de manejar tus problemas personales?
   ___0=Nunca ___1=Casi nunca ___2=De vez en cuando ___3=A menudo ___4=Muy a menudo

7. ¿Con que frecuencia has sentido que las cosas te van bien?
   ___0=Nunca ___1=Casi nunca ___2=De vez en cuando ___3=A menudo ___4=Muy a menudo

8. ¿Con que frecuencia has sentido que no podías afrontar todas las cosas que tenías que hacer?
   ___0=Nunca ___1=Casi nunca ___2=De vez en cuando ___3=A menudo ___4=Muy a menudo

9. ¿Con que frecuencia has podido controlar las dificultades de tu vida?
   ___0=Nunca ___1=Casi nunca ___2=De vez en cuando ___3=A menudo ___4=Muy a menudo

10. ¿Con que frecuencia has sentido que tienes el control de todo?
    ___0=Nunca ___1=Casi nunca ___2=De vez en cuando ___3=A menudo ___4=Muy a menudo

11. ¿Con que frecuencia has estado enfadado/a porque las cosas que te han ocurrido estaban fuera de tu control?
    ___0=Nunca ___1=Casi nunca ___2=De vez en cuando ___3=A menudo ___4=Muy a menudo
12. ¿Con qué frecuencia has pensado sobre las cosas que no has terminado (pendientes de hacer)?
___0=Nunca ___1=Casi nunca ___2=De vez en cuando ___3=A menudo ___4=Muy a menudo

13. ¿Con qué frecuencia has podido controlar la forma de pasar el tiempo (organizar)?
___0=Nunca ___1=Casi nunca ___2=De vez en cuando ___3=A menudo ___4=Muy a menudo

14. ¿Con qué frecuencia has sentido que las dificultades se acumulan tanto que no puedes superarlas?
___0=Nunca ___1=Casi nunca ___2=De vez en cuando ___3=A menudo ___4=Muy a menudo

CALIFICACION FINAL ____________

APENDIX K

SHORT ACCULTURATION SCALE (ENGLISH)

Please mark the answer that describe your language preference

1. In general, what language(s) do you read and speak?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Only Spanish</td>
<td>Spanish better than English</td>
<td>Both Equally</td>
<td>English better than Spanish</td>
<td>Only English</td>
</tr>
</tbody>
</table>

2. What was the language(s) you used as a child?

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</table>

3. What language(s) do you usually speak at home?

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4. In which language(s) do you usually think?

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5. What language(s) do you usually speak with your friends?

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TOTAL SCORE: __________
APENDIX L

SHORT ACCULTURATION SCALE (SPANISH)

Marque la respuesta que describa su preferencia de idioma(s)

1. Por lo general, que idioma(s) lee y habla usted?

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<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solo Español</td>
<td>Más Español que Inglés</td>
<td>Ambos por igual</td>
<td>Más Inglés que Español</td>
<td>Solo Inglés</td>
<td></td>
</tr>
</tbody>
</table>

2. Cual fue el idioma(s) que hablo cuando era niño(a)

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<thead>
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</tr>
</tbody>
</table>

3. Por lo general, en qué idioma(s) habla en su casa?

<table>
<thead>
<tr>
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<td></td>
</tr>
</tbody>
</table>

4. Por lo general, en qué idioma(s) piensa?

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<td></td>
</tr>
</tbody>
</table>

5. Por lo general, en qué idioma(s) habla con sus amigos(as)?

<table>
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CALIFICACION TOTAL: ___________
CURRICULA VITA

Guillermina R. Solis initiated her nursing profession as an Associate Degree Registered Nurse in 1978 from New Mexico State University, Las Cruces, New Mexico. She completed her Baccalaureate degree in nursing in 1986 from The University of Texas at El Paso, and her Master’s degree in 1995 from the University of Arizona, School of Nursing, Tucson, Arizona with a major in Geriatric Nurse Practitioner. She later received a Post Master’s degree in Family Nurse Practitioner from the University of San Diego, San Diego, California in 2001.

Ms. Solis’ professional nursing career was initiated in acute care settings, primarily hospital settings. She spent a large portion of her nursing career as a nurse and charge nurse in Critical Care areas and Wound Care services. She was promoted to administrative roles and established the first overnight short-stay hospital unit and the first in-hospital Skilled Nursing Facility in El Paso, Texas in 1989 and served as Clinical Administrator until 1993.

Since her Nurse Practitioner (NP) degree, she has worked as a primary health care provider in El Paso, Texas. She is among the first Nurse Practitioners in the city and was the first self-employed NP in the area. She has been committed to serving the El Paso community and volunteers in indigent care clinics as well as serving as a medical missionary in Mexico.

Ms. Solis initiated her Ph.D. degree in Interdisciplinary Health Science, College of Health, Science and School of Nursing spring of 2005 and joined The University of Texas at El Paso as a part-time lecturer for the Family Nurse Practitioner in 2008. Her faculty role expanded to full-time educator in 2010 and is now a Clinical Associate Professor in the Nurse Practitioner programs, Acute Care and Family Nurse Practitioner, and in the graduate nursing school. She has received training and certification for online distance education and has designed online graduate courses incorporating social network media methods to enhance student learning.