

## Physical Activity, Obesity, Nutritional Health and Quality of Life in Low-Income Hispanic Adults With Diabetes

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### **Abstract:**

The study examined relationships among age, body mass index (BMI), physical activity, nutritional health, quality of life, and health-related quality of life in Hispanic adults with diabetes ( $N = 59$ ) using the PRECEDE-PROCEED planning model as a framework. Data were collected through face-to-face interviews at clinics and communities. A regression model with predisposing factors (age, BMI), and behavior (nutritional health and physical activity) significantly predicted quality of life ( $R^2 = 0.21$ ,  $F = 3.63$ ,  $p < .05$ ) explaining 21% of variance. Physical activity and nutrition were the strongest predictors. Culturally competent intervention strategies must include factors that improve and enhance quality of life.

### **Article:**

### **Introduction**

Diabetes affects approximately 2.5 million Hispanic/Latino American adults, or 10.4% of the US Hispanic population (Center for Disease Control and Prevention, [CDC] 2008a). Hispanic/Latino Americans are 1.7 times more likely, and Mexican Americans twice as likely, to develop diabetes as non-Hispanic Whites (Office of Minority Health [OMH], 2008a). Diabetes is the fifth leading cause of death among Hispanics in the United States (CDC, 2005), with death rates 60% higher than those of non-Hispanic Whites in 2005. Of the 35 million Hispanics living in the United States, 10.4% have been diagnosed with diabetes, compared to 6.6% of non-Hispanic Whites (OMH, 2008b).

Factors contributing to the burden of diabetes among minority groups include the seriousness of diabetes, inadequate access to proper diabetes prevention and management programs, and inadequate quality of care. Also, individual factors such as improper nutrition, physical inactivity and obesity contribute to the high risk of diabetes in Hispanics (CDC, 2005). More Hispanics (31.1%) report fair or poor health than non-Hispanic Whites (12.9%), and more Spanish-speaking Hispanics report poor or fair health status (39%) than English-speaking Hispanics (17%; CDC, 2008b). Hispanics report physical health and mental health and activity limitations (DuBard & Gizlice, 2008). In addition, older Hispanics with diabetes reported poorer health-related quality of life (HRQOL) than individuals without diabetes (Graham et al., 2007).

In *Healthy People 2010* (Department of Health and Human Services [DHHS], 2000), quality of life (QOL) is an important indicator of health. QOL refers to a sense of well-being, happiness and satisfaction (DHHS, 2000). Health-related QOL refers to an individuals' perception of physical and mental health status over time (CDC, 2009a). Much emphasis is being placed on improving quality and years of life and eliminating health disparities (DHHS, 2006). However, little is known about the role of physical activity, obesity, and nutrition in QOL and health-related QOL among Hispanics with type-2 diabetes. Given the high prevalence of diabetes in the

Hispanic population. and its associated complications, research needs to focus on this ethnic group. Understanding diabetes and its related health factors are necessary to develop interventions and determine if Hispanics require different methods and strategies (Garcia, 2008; Magwood, Zapka, & Jenkins, 2008). Therefore, this study examined QOL and health-related QOL of Hispanics with type-2 diabetes, and factors associated with QOL and health-related QOL.

The PRECEDE-PROCEED Planning Model was used as a framework for the study (Green & Kreuter, 2004). This model describes factors influencing health outcomes and provides a comprehensive structure for health needs assessment, program design, implementation, and evaluation of health promotion programs. The PRECEDE phases include social, epidemiological, behavioral and environmental, educational, ecological, administrative and policy assessment. The model posits that predisposing, reinforcing, and enabling factors have an effect on behavior and the environment; therefore, through behavior and environment, predisposing, reinforcing, and enabling factors have an impact on QOL. Components of the model used in this study were predisposing factors (age and body mass index [BMI]), behavioral factors (physical activity and nutritional health), and QOL, measured with both generic and disease-specific instruments.

## QOL

Hispanic adults with diabetes have been found to have higher morbidity and mortality than non-Hispanic Whites. Hispanic adults have a higher prevalence of cardiovascular disease risk factors and diabetes complications than non-Hispanic Whites (OMH, 2008a), and these complications have a negative impact on QOL (Lloyd, Sawyer, & Hopkinson, 2001). Graham and colleagues (2007) found that older Mexican Americans with diabetes had poor health-related QOL in the domains of physical functioning, bodily pain, general health, social functioning, and role emotion. Hispanics with diabetes perceived lower QOL due to dietary restrictions (Misra & Lager, 2009). However, studies of QOL and health-related QOL in Hispanics with diabetes are few.

## Predisposing Factors and QOL

Older age has been associated with poorer health-related QOL (Redekop et al., 2002). Older adults perceive greater role limitations due to physical problems, but report better social function in the mental component of health-related QOL. Trief, Wade, Pine, and Weinstock (2003) found that age independently predicted QOL. Older adults ( $\geq 65$  years) with diabetes perceived a better QOL than younger adults (30-64 years) with diabetes, reporting greater satisfaction with diabetes-related aspects of their lives and less emotional distress and better coping with diabetes.

Several studies have explored the impact of obesity on health-related QOL. Authors reported that obesity was associated with impaired health-related QOL (Damush, Stump, & Clark, 2002; Jia & Lubetkin, 2005; Rejeski et al., 2006). Individuals in the general adult US population who are overweight or obese and those with diabetes have significantly lower scores on health-related QOL, particularly on physical health of health-related QOL (Jia & Lubetkin, 2005; Rejeski et al., 2006). The physical health component of health-related QOL decreases with increased BMI in overweight and obese adults with type-2 diabetes (Rejeski et al., 2006).

## Behavioral Factors and QOL

Physical activity for 150 min each week is recommended by the CDC (2008c). The National Health Interview survey and the third National Health and Nutrition Examination Survey (CDC, 2000) have found that Hispanics have lower levels of leisure-time activity than non-Hispanics (Neighbors, Marquez, & Marcus, 2008), and 40%

of Mexican Americans report leisure time inactivity (Crespo, Smit, Andersen, Carter-Pokras, & Ainsworth, 2000). A large percentage of Mexican Americans with diabetes do not participate in any leisure time activity (Wood, 2004).

Physical activity has been associated with improved health-related QOL (Brown et al., 2003; Li, Jiles, Ford, Giles, & Mokdad, 2007; Wendel-Vos, Schuit, Tijhuis, & Kromhout, 2004). Studies have found that an association between leisure time physical activity and health-related QOL (Brown et al., 2003; Wendel-Vos et al., 2004). Li and colleagues (2007) examined the relationship between healthy lifestyle habits, including nonsmoking, leisure time physical activity, and healthy eating in U.S. adults with diabetes using national data from the 2005 Behavioral Risk Factor Surveillance Survey. Results indicate that healthy lifestyle habits were associated with health-related QOL. Adults who were physically inactive reported poorer health-related QOL than adults who were physically active. Performing the recommended levels of physical activity was associated with both better health-related QOL and health outcomes, including improved mobility, decreased pain, and higher emotional wellbeing (Brown et al., 2003; Sawatzky, Liu-Ambrose, Miller, & Marra, 2007).

Physical function limitations can have a negative impact on QOL (Polansky, 2000). Diabetics can suffer limitations due to vision difficulties, peripheral neuropathy, amputation, or heart disease (Huang et al., 2009). QOL has been reported lower in Hispanics with diabetes, who have higher number of symptoms than in non-Hispanics with diabetes (Garcia, 2008) and in non-Hispanics without diabetes (Graham et al, 2007).

Many Hispanic Americans consume high amounts of carbohydrates and fat, and do not meet recommended nutrient intake and dietary guidelines (Dixon, Sundquist, & Winkleby, 2000; Glasgow et al., 2006; Wen, Shepherd, & Parchman, 2004). Keller, Osbye, and Goy (2004) used the Determine Checklist to examine the relationship between nutritional health and QOL, and found that poorer nutritional health is a predictor of decreased QOL in older adults. Although nutrition is an important indicator of QOL and well-being in older adults (Drewnowski & Evans, 2001; Thomas, 2001), few studies have examined the effects of nutritional health on health-related QOL in Hispanics with diabetes.

## **METHODS**

A descriptive correlational design was used to examine the relationships among physical activity, obesity, nutritional health, QOL, and health-related QOL in Hispanic adults with type-2 diabetes. Sociodemographic variables describe the sample.

### **Sample and Setting**

A convenience sample of 59 adult Hispanics with type-2 diabetes was recruited from free/subsidized clinics, churches, and community centers in the southeastern United States. Criteria for inclusion were (a) self-identified ethnicity as Hispanic or Latino; (b) medical diagnosis of type-2 diabetes on the clinical record; (c) age 20 years or older; (d) ability to speak English or Spanish; and (e) oriented to time, place, and person. A sample size of 53 would provide 80% power at an alpha level of 0.05 to detect a  $R^2$  of .25 for four variables using multiple regression (nQuery Advisor Release 6.10, 2004).

### **Procedures**

Participants were recruited at local Hispanic clinics, ethnic churches, and the community Hispanic center by the staff and research assistants. Research team members were present during clinic times. Informed consent was obtained through bilingual research assistants prior to data collection. Data were collected via face-to-face

interviews using trained interpreters, Spanish versions of questionnaires, and standardized physiological equipment. Physiological data (blood pressure, HbA1C, lipid profile, weight, height, and waist circumference) were collected by a registered nurse. It took approximately 30 min for a participant to complete the interview and assessment. At the completion of data collection, each participant received a \$20.00 grocery store gift certificate as a measure of appreciation. The study was approved by the university Institutional Review Board.

## Measurements

A demographic form was used to collect data on participants' age, gender, marital status, level of education, income, financial strain (ability to pay monthly bills), insurance status, country of origin, family history of diabetes and cardiovascular disease, smoking status, and comorbidities. Smoking status was defined as whether they currently, formerly, or never smoked and, if current smoker, the number of cigarettes or cigars smoked per day and how long the patient has been smoking (CDC, 1998). The presence of comorbidities was assessed by asking participants whether a physician had ever told them that they had heart disease, high blood pressure, kidney disease, or stroke.

Blood pressure was measured following standardized blood pressure protocol guidelines of the Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure (Chobanian et al., 2003). Participants were asked to sit quietly for at least 5 min in a chair before blood pressure was taken. Phase I and V Korotkoff' sounds were used to determine systolic and diastolic blood pressure readings (Chobanian et al., 2003). Participants who had blood pressure  $\geq 130/85$  mmHg or used antihypertensive medications were considered hypertensive.

Glycemic control was measured using the glycated hemoglobin A1C (HbA1C) blood test, which reflects glycemic control over the past 2-3 months. HbA1C was collected using finger stick blood by a registered nurse with a hemoglobin A1C machine (CA, USA). A1C  $> 7.0\%$  is considered abnormal (American Diabetes Association, 2008).

Total cholesterol, high-density lipoproteins (HDL), low-density lipoproteins (LDL), triglycerides (TG) and nonfasting glucose were obtained through capillary finger stick. A portable analyzer and test cassette system (The Cholestech LDX machine) were used to analyze the lipid profile and glucose. The accuracy and precision of Cholestech LDX profiles are comparable to those obtained by reference methods used routinely in clinical diagnostic laboratories (Cholestech, 2005a, 2005b). Calibration of the Cholestech LDX machine with control cartridges was performed before the test to assure the accuracy of readings. Lipid values were considered abnormal if triglycerides were  $\geq 150$  mg/dL and HDL was  $< 40$ mg/dL in men, or  $< 50$ mg/dL in women (Grundy et al., 2005).

Height was measured with a stadiometer vertical board and an attached metric ruler and a horizontal headboard. Participants were instructed to stand on the base of the board with feet at a 60 degree angle and shoes off. Participants stood facing directly ahead with heels, buttocks, shoulder blades, and back of head touching the vertical board. The head of the stadiometer was placed to the highest point of the head. Measurement was recorded to the nearest 1 millimeter just before exhalation (CDC, 2008d).

Weight was measured with an electronic weight scale. Participants were asked to stand completely still in the center of weight scale with feet close together and eyes looking straight forward. Weight was recorded in kilograms to 2 decimal points (CDC, 2008d).

BMI was calculated by dividing subjects' weight (measured in kilograms) by the square of their height (measured in meters; CDC, 2009b). A participant was categorized as overweight if BMI was 25 to 29.9 kg/m<sup>2</sup>, and obese if body mass index was 30 kg/m<sup>2</sup> or more (CDC, 2009b; National Institutes of Health & National Heart, Lung and Blood Institute [NIH], 1998).

Waist circumference was measured using the Gantt tape measure, by wrapping the tape at the top of the right iliac crest in a horizontal plane around the abdomen. This measure was taken after the participant exhaled without the tape compressing the skin. Measurements were recorded to the nearest 0.1cm (NIH, 1998). Participants were asked to remove any bulky belt, coat, or other clothing to measure the tape against the skin. A participant was categorized as high risk if waist circumference was greater than 40 inches (102cm) for men, and greater than 35 inches (88cm) for women (NIH, 1998).

Physical Activity was measured using the Exercise and Leisure-Time Physical Activity (LTPA) items from the National Health and Nutrition Examination Survey (CDC, 2000). Frequency and types of leisure time physical activity (> 3 times / week) were assessed. Each activity was coded *yes* or *no*, then summed for the total number of LTPA which was used to determine whether persons met activity recommendations.

The 10-item Determine Your Nutritional Health Checklist as a behavior risk factor was used to assess dietary intake and meal patterns. A summed score of 0-2 indicates low nutritional risk, 3-5 moderate risk, and 6 or more high risk (Barrocas, White, Gomez, & Smithwick, 1996). Specificity and sensitivity were reported as 0.54 and 0.75, respectively (de Groot, Beck, Schroll, & van Staveren, 1998). The reliability and validity of the instrument have been established (Souter & Keller, 2000). Although this instrument was originally developed for use with older adults, content validity for Hispanics and low-income persons from early adulthood to older adulthood was established by an expert panel of a doctorally prepared nurse practitioner who worked with low income populations, a masters-prepared public health nurse, a doctorally prepared maternal/child nurse, and a doctorally prepared adult health nurse who taught nutrition. Content validity index (CVI) is 1.0.

The Quality of Life Index-Diabetes Version (QLI; Ferrans and Powers, 1985) Spanish version was used to measure disease specific QOL. The QLI has two parts: measurements of satisfaction with life and the importance of those aspects in four domains—health and functioning, psychological/spiritual, social and economic, and family (Ferrans, 1996; Ferrans & Powers, 1985). Each item is scored from 1 (*very dissatisfied*) to 6 (*very satisfied*). Scores are calculated by weighting each item with its paired importance response. Summed scores range from 0-30 with higher scores indicating better QOL. Reliability and validity have been established in the general population (Ferrans & Powers, 1992) and in adults with diabetes (DeSouza & Nairy, 2003).

The 12-item Medical Outcomes Study Short Form (SF-12) Health Survey was used to measure health-related QOL (Ware, Kosinski, & Keller, 1996). The SF-12 consists of two major constructs: physical health and mental health, with eight health concepts (physical functioning, role limitations due to physical functioning, bodily pain, general health perceptions, role limitations due to emotional problems, vitality, general mental health, and social functioning). The SF-12 uses Likert scaling. Each subscale score is transformed from the normal scaling to a 0 to 100 standardized score, with higher scores representing more positive health and better health-related QOL. The SF-12 has demonstrated good internal-consistency reliability, with alpha coefficients on the components ranging from  $\alpha=.72$  to  $\alpha=.89$  (Parker, 2001; Resnick & Nahm, 2001), and it has been used with both genders, and multiple age and ethnic populations in a variety of settings. The SF-12 Spanish version was used in this study. The SF-12 Spanish version has been validated in Hispanics with type-2 diabetes (Brown et al, 2003; Huang et al, 2009). Cronbach's alphas for the SF-12 in this study ranged .78 for mental health components to .82 for physical health components.

A bilingual translator translated the English version of the demographic form and the Determine Your Nutritional Health Checklist into Spanish, then a back translation was completed. Verification of translations, bilingual meaning error checks, and content equivalence analysis were performed to ensure accurate language translation (Berry, 1993) and understanding at the appropriate level of education for participants who had low literacy skills.

## Analysis

Descriptive statistics including frequencies, proportions, means and other measures of central tendency were used to characterize the sample. Hierarchical multiple regression was used to identify predictors of QOL, and the physical and mental components of health-related QOL in three separate models. To control for demographic variables, age was entered in the model in the first block and BMI, physical activity, and nutritional health were entered in the second block of the model. The alpha level of significance was set at .05. SPSS 15.0 was used for the analyses.

Pearson's correlation coefficients were used to examine multicollinearity among variables prior to regression analyses. Coefficient alpha was calculated to assess reliability of tools with this sample.

## RESULTS

### Demographic Characteristics

The mean age of participants was 49 years ( $\pm 12.56$ ), with a range from 23 to 72 years; 68% were women and 71% were married. The majority (73%) had less than 12 years of education. Most participants came from Mexico (74%) and the average length of time in the United States was 9 years. The majority did not have health insurance (92%). Sixty percent of the participants had household income less than \$10,000, and 40% reported having financial strain (unable to pay their monthly bills; Table 1).

The length of time participants had been diagnosed with diabetes averaged 4.5 years ( $\pm 0.25$ ). Most participants were overweight or obese (93.2%), with poor diabetic control ( $HbA1C > 7\%$ ). The average BMI was 32.42 ( $SD = 5.89$ ; obese), 29.8% were overweight and 63.2% obese. Half of the male participants (52%) had a waist circumference  $> 102$  cm/40 inches (high risk) and the majority of female participants (90%) had a waist circumference  $> 88$ cm/35 inches. Most were at moderate (30.5%) or high nutritional risk (64%). The majority took oral medications for diabetes, but 25.6% were on insulin. Only 17% met physical activity recommendations; 8.6% of the participants were currently smokers and 27% were previous smokers. The most frequently reported comorbidities were hypertension (51%), followed by kidney disease (25.4%), heart disease (12.3%), and stroke (5.1%). Seven percent of the participants reported a previous heart attack. Half of the sample reported a family history of diabetes (50%).

**TABLE 1 Demographic and Health-Related Characteristics of the Participants ( $N = 59$ )**

<i>Variables</i>	<i>N</i>	<i>M</i>	<i>SD</i>	<i>%</i>
Age	48		12.56	
Gender				
Female	40			67.8
Male	19			32.2
Married	39			70.3
Widowed	3			5.5
Divorced	4			7.3
Country of Origin				
US	2			3.4
Mexico	43			72.9
Puerto Rico	2			3.4
Other	12			20.3
Triglycerides		238.86	142.64	
Cholesterol	58	184.14	44.97	

**TABLE 1 Demographic and Health-Related Characteristics of the Participants (N = 59)**

<i>Variables</i>	<i>N</i>	<i>M</i>	<i>SD</i>	<i>%</i>
HDL	56	42.23	11.30	
LDL		113.5	38.89	
Blood Pressure Systolic	59	140.14	19.75	
Diastolic	59	84.92	11.37	
BMI in kg/m <sup>2</sup>		32.43	0.50	
Hypertension	30			50.8
Heart Disease	7			12.3
Kidney Disease	15			25.4
Stroke	3			5.1
Ever Smoked	17			56.7
Smokers	5			8.6
Nutritional Risk:				
Low	4			6.8
Moderate	18			30.5
High	37			62.7

### QOL and Health-Related QOL

Almost half of the participants (44.1%) rated their health as fair or poor. Mean scores on the health-related quality measures by the SF-12 and the QLI are presented in Table 2. The lowest self-rated health-related aspect of QOL was general health ( $M = 44.66$ ), followed by mental health ( $M = 48.30$ ), role emotion due to health problems ( $M = 59.54$ ), the mental health component (MCS;  $M = 60.22$ ) and the physical health component (MCS;  $M = 62.44$ ). Participants were least satisfied with health and functioning ( $M = 22.11$ ), followed by social and economic function ( $M = 23.13$ ). The greatest satisfaction was with family ( $M = 25.21$ ).

### Correlations and Multiple Regression

Pearson's correlation coefficients ( $r$ ) indicated that physical activity was significantly correlated with QOL ( $r = .24, p < .05$ ), and nutritional health was significantly correlated with QOL ( $r = -.35, p < .05$ ; Table 2). No variables were significantly correlated with the PCS ( $p > .05$ ) or the MCS ( $p > .05$ ) of health-related QOL (Table 3).

A regression model including predisposing factors (age, BMI) and behavior (nutritional health and adherence to physical activity recommendations [yes/no]) was significantly predictive of QOL ( $R^2 = 0.21, F = 3.63, p < .05$ ), explaining 21% of variance in the QLI. Predisposing factors and behavior did not significantly predict scores on the PCS ( $F = 0.99, p > .05$ ) or the MCS of health-related QOL ( $F = 0.53, p > .05$ ) (Table 4).

**TABLE 2 Mean Scores of the 12-item Medical Outcomes Study Short Form (SF-12) and the Quality of Life Index (QLI; N = 59)**

<i>Variable</i>	<i>M</i>	<i>SD</i>
SF-12		
PF	71.61	35.19
RP	64.84	27.71

**TABLE 2 Mean Scores of the 12-item Medical Outcomes Study Short Form (SF-12) and the Quality of Life Index (QLI; N = 59)**

<i>Variable</i>	<i>M</i>	<i>SD</i>
BP	68.84	29.94
GH	44.66	26.36
VT	63.53	27.20
SF	69.64	25.46
RE	59.54	29.39
MH	48.30	17.13
PCS	62.44	22.18
MCS	60.22	16.83
QLI	23.40	3.55
HF	22.11	4.68
SOC	23.13	4.20
PSP	24.95	4.67
FAM	25.21	3.70

**TABLE 3 Pearson's Correlation Matrix (N = 59)**

<i>Variable</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>
* <i>p</i> < .05.							
** <i>p</i> < .01.							
1. Age	—						
2. BMI	-.163	—					
3. PA met	.041	.085	—				
4. Nutritional Health	.235	-.178	.103	—			
5. QLI	-.136	.008	.240*	-.350**	—		
6. SF-12-PCS	-.193	.131	-.064	-.190	.510**	—	
7. S-12-MCS	-.125	.063	-.023	-.172	.455**	.611**	—

**TABLE 4 Multiple Regression of Significant Predictors of the Quality of Life (N = 59)**

<i>Variables</i>	<i>B</i>	<i>SE</i>	$\beta^a$
<i>Note.</i> Step 1: $R^2 = .01$ , $\Delta R^2 = .01$ , $F(2, 56) = .34$ , $p > .05$ . Step 2: $R^2 = .21$ , $\Delta R^2 = .20$ , $F(2, 56) = 6.71$ , $p < .05$ .			
* <i>p</i> < .05.			
<sup>a</sup> Beta shown are for the last step.			
Step 1. Age	-0.14	.04	-.05
Step 2. BMI	-.07	.04	-.10
Physical activity	2.91	1.24	.29*
Nutritional health	-.37	.12	-.39*

## DISCUSSION

### QOL and Health-Related QOL

In this study, Hispanics with diabetes perceived their health to be fair or poor, and rated their general health as lowest in health-related QOL. These findings are consistent with previous studies in which Hispanics consistently reported poor or fair health and low QOL (Garcia, 2008; Magwood et al., 2008) and health-related QOL (CDC, 2008b, Dubard & Gizlice, 2008; Graham et al., 2007). Participants also reported that they were least satisfied with health and functioning, suggesting that the burden of disease for Hispanics with diabetes may lead to progressive impairment of their functioning in general health. Similarly, Brown and colleagues (2004) reported that diabetes was associated with perception of poor general health and impaired physical functioning. The fact that the majority of participants in this study had comorbidities may have contributed to their low perceptions of health-related QOL. A recent study indicated that comorbidities had the largest impact on health-related QOL among people with diabetes (Maddigan, Feeny, Majumdar, Farris, & Johnson, 2006). Other factors that might have been related to their perceptions of poor health were economic barriers to treatment, late diagnosis, and morbidity and mortality from diabetes and its complications (Agency for Healthcare Research and Quality, 2007).

These Hispanics with diabetes reported lower scores on the mental health component of health-related QOL than on the physical health component. The findings are consistent with previous reports that found that persons with diabetes showed poorer mental health than physical health on health-related QOL (Glasgow, Ruggiero, Eakin, Dryfoos, & Chobanian, 1997; Graham et al., 2007). Hispanic adults with diabetes in this study reported poor mental health and role emotional limitation due to health problems. Participants in this study had substantially poorer health-related QOL in the domains of mental health ( $M = 48.30$  vs  $M = 59.70$ ) and social functioning ( $M = 69.64$  vs  $M = 77.50$ ) than in a large national sample of adults with diabetes (Glasgow et al., 1997). The findings are consistent with the study that Latinos had the lowest scores in mental health component of the health-related QOL compared to other ethnic groups (Huang et al., 2009). An epidemiologic study has shown that education, social economic status, social assistance, stress, physical activity, and sense of belonging are attributable to health-related QOL (Maddigan et al., 2006). The findings that the sample had low literacy, a low level of education, low socio-economic status, and were not physically active, might help to explain their poor health-related QOL.

### **Relationships Among Predisposing Factors, Behavior, and QOL and Health-Related QOL**

Previous studies have found that physical activity and diet are associated with QOL and health-related QOL in the general population and in Hispanics (Brown, et al., 2003; Li et al., 2007; Sawatzky et al., 2007; Wendel-Vos et al., 2004). The findings of this support the Phases II (Epidemiological assessment) and III (Educational and ecological assessment) of the PRECEDE-PROCEED Planning Model in Hispanic adults with diabetes for QOL measured with the QLI but not the SF-12. Predisposing factors (age, BMI) and behavior (physical activity and nutritional health) together explained 21% of variance in health-related QOL, with physical activity and nutritional health as the strongest predictors. Similar findings were found in US adults with diabetes from the Behavioral Risk Factor Surveillance Survey (Li et al., 2007) that healthy lifestyle including nonsmoking, engaging in adequate leisure time physical activity, and consuming five or more servings of fruits and vegetables per day was associated with better health-related QOL. Using the PRECEDE-PROCEED Planning Model, 21% of the variance in health-related QOL was explained by predisposing factors and behavior. This suggests that there may be other variables that influence health-related QOL in Hispanic adults with diabetes.

Our findings were that Hispanics with diabetes who engaged in recommended physical activity perceived better QOL. The relationship of physical activity to health-related QOL has been supported in other studies. Adults who regularly had recommended levels of activity reported better health-related QOL and health status than those who were physically inactive (Brown et al., 2003; Li et al., 2007). Wendel-Vos and colleagues (2004) found a positive relationship between leisure time physical activity and health-related QOL for general health perception, vitality, and social functioning. The fact that the majority of participants in this study did not meet physical activity recommendations may have contributed to their low perceived health-related QOL. Physical

functional limitations due to diabetes complications also may have also influenced their poor QOL (Garcia, 2008; Polonsky, 2000).

Obesity was not a strong predictor of QOL, although previous research has shown that obesity is negatively associated with health-related QOL in the general US population. High BMI and waist circumference and low levels of physical activity are consistently associated with poor QOL (Glasgow et al., 1997). People who engaged in moderate or vigorous physical activity tended to have a low risk of being obese and perceived a better health-related QOL among individuals at different levels of BMI (Jia & Lubetkin, 2005; Rejeski et al., 2006).

Nutritional health was a strong predictor of health-related QOL in this study. Keller and colleagues (2004) also found a relationship between nutritional health and QOL in older community-dwelling adults suggesting that nutrition had the potential influence on QOL in physical, psychological, and interpersonal perspectives. Another study reported that Hispanics with diabetes had difficulties with dietary management and perceived poor QOL due to dietary restrictions (Misra & Lager, 2009).

## Limitations

This study used a small, nonprobability sample from the community, reducing the potential to detect significant relationships and limiting the generalizability of the results. Further, although using native Hispanic interpreters for face-to-face interviews could strengthen the validity of the study, responses may have been prone to social desirability. Nevertheless, the study findings support the literature and the relationships among predisposing factors, behavior, and QOL in this sample of low-income Hispanic adults with diabetes.

## Implications

Community health nurses need to develop interventions using holistic and contextual approaches to Hispanics with diabetes. For example, nutrition alterations must include culturally acceptable diet and food preparation. Physical activity behaviors must include families, developing and utilizing options in the local community or church, be economically feasible, and consider the patriarchal or matriarchal beliefs and practices. As noted by Magwood et al. (2008) and Garcia (2008), the growing Hispanic community requires different methods and strategies for effective interventions. The new focus on patient-centered care demands a more clear understanding of culture and acculturation and the role they play in meeting patient needs. Formal and continuing education of nurses and other health professionals requires inclusion of culture specific health knowledge, strategies, and care provision. Regardless of the purpose (practice, research, or education), culturally competent intervention strategies must include factors that improve and enhance QOL and the symptoms and management requirements of Hispanic diabetics. Continued research to identify those requirements and effective efforts is needed.

## CONCLUSIONS

This sample of Hispanics with diabetes had poor QOL both on a disease specific and the general health-related QOL measure. Similar to other population groups, a variety of factors were related to QOL. Physical activity and nutrition, so important to diabetes management, had impacts on the QOL measures. Physical and mental function, overall well-being, and social expectations are part of a person's perception of his or her QOL. Interventions must include the context of QOL for Hispanics with diabetes and necessitate innovative strategies to meet the needs of this population to live an optimal life.

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## Notes

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