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Research Article

Associations between the Presence of Type 2 Diabetes and Health-Related Quality of Life (HRQoL) among US Hispanic Population

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Abstract

Introduction: Very few studies have captured the association in health-related quality of life (HRQoL) by the presence of type 2 diabetes (T2D) among the US Hispanic population.

Aim: This study was to examine the association of the presence of T2D on HRQoL measure in the US Hispanic population.

Methods: This was a cross-sectional study analyzing data from the 2014-2015 Medical Expenditure Panel Survey (MEPS). This data comprised of the Hispanic population of 13,933 members (estimated population size: 36,440,400) with T2D in the US. Two multivariate regression models were used to predict HRQoL (Short Form 12) by the presence of T2D among the Hispanic population.

Results: Results showed 89.1% did not have T2D condition (n=12,423), while 10.9% had T2D conditions (n=1,510). SF-12 PCS scores were 45.85 (95% CI; 44.65, 47.05) in Hispanic population with T2D and 51.23 (95 % CI; 50.77, 51.68) in Hispanic population without T2D. SF-12 MCS scores were 52.52 (95% CI; 51.98, 53.05) in patients without T2D and 49.59 (955 CI; 48.34, 50.76) in Hispanic population with T2D conditions.

Conclusion: The study suggests that the presence of T2D worsens HRQoL measured by individuals' physical and mental health status among the US Hispanic population compared with non-T2D Hispanic population. Psychiatric assessment and management of T2D minority population may improve patient HRQoL.

Keywords: Type 2 Diabetes; Health-Related Quality of Life (HRQoL), SF-12,; Hispanic population

Introduction

Type 2 Diabetes (T2D) is estimated to become the seventh leading cause of death worldwide by 2030 [1]. The International Diabetes Federation (IDF) has estimated that out of 415 million people living with diabetes worldwide, 4.9 million deaths occurred due to complications of the disease [2]. Patients living with diabetes make up 8.8% of the population worldwide [2]. In the United States, T2D affects 6.3% of the population or about 29 million people [3,4]. It is important to note that this number is likely to be much higher as about 8.1 million others may not be diagnosed [4]. Diabetes has been linked to a higher prevalence of Cardiovascular Disease (CVD) compared to those who live without diabetes. The main cause of disability and death among those with diabetes is CVD [2]. Diabetes is also associated with other serious health issues including retinopathy, blindness, organ failure, renal disease, neuropathy, lower extremity amputations and ulcers [3,4]. According to the Centers for Disease Control and Prevention (CDC), the medical cost of diabetes in 2017 was close to $327 billion [5].

T2D affects approximately 2.5 million Hispanic and Latino American adults, or 10.4% of the U.S Hispanic population [6]. Compared to non-Hispanic Whites, Hispanic and Latino Americans are about twice as likely to develop diabetes, as diabetes is the fifth leading cause of death among Hispanic Americans [6]. Hispanics are more likely to be hospitalized due to uncontrolled diabetes and are more likely to suffer from complications of uncontrolled blood glucose levels than whites [7]. Hispanics are also 1.5 times more likely to die from diabetes compared to their white counterparts [7]. Lack of access to diabetes education, prevention programs, poor self-management and inadequate quality of care contribute to the high prevalence of diabetes in Hispanic Americans [6,7]. Other factors that contribute to the high prevalence of diabetes in this population include physical inactivity, poor nutrition, and obesity. Approximately 31.1% of Hispanics report fair or poor health compared to 12.9% of non-Hispanic whites, and there is a larger portion of Spanish-speaking Hispanics who report fair or poor health status (39%) when compared to English-speaking Hispanics (17%) [6].

Type 2 diabetes is defined as a condition that causes hyperglycemia resulting from the body’s inability to use glucose for energy. In this disease state, the pancreas is unable to provide enough insulin and the body is unable to use insulin properly [8]. There are many risk factors that cause type 2 diabetes such as family medical history, modifiable risk factors such as obesity and smoking, and non-modifiable risk factors such as age, race, or ethnicity. This disease state becomes more complicated in patients with older age due to changes in

body composition (more body fat, less muscle mass), metabolism (fewer calories burned), and function (less physically active) [8]. The elderly Hispanic population (≥ 65 years) is increasing at a rate that is 2 times that of the non-Hispanic White population and is projected to reach 15 million by 2050 [9]. The Hispanic population with advanced age is a sub-population that has a high prevalence of T2D, therefore it is of great interest in the study of this disease state [10].

Health-related quality of life (HRQoL) is a "multi-dimensional concept that includes domains related to physical, mental, emotional, and social functioning [11]." HRQoL is an important factor that must be taken into consideration when analyzing health outcomes of patients with diabetes. The HRQoL of Hispanic/Latino patients with diabetes is affected by different social and cultural influences such as diet, family networks, cultural or religious traditions, access to care, and language barriers. These factors affect the HRQoL in the Hispanic/Latino population in ways that do not affect the non-Hispanic White population [9]. Studies regarding the effects of cultural values and health beliefs within the Hispanic/Latino population suffering from diabetes have provided no consensus as to the influence of these characteristics on the disease experience or management approach of individuals in this sub-group [9].

While sufficient amount of research has been conducted to address diabetes and HRQoL [10], to the authors' best knowledge, there is only one study available, which determined the association between diabetes and HRQoL among Hispanic population [9]. The primary objective of this study is to examine the association between the presence of T2D and the health-related quality of life (HRQoL) in Hispanic/Latino adults in the U.S.

Methods

Study design

This cross-sectional study used data from the 2014-2015 Medical Expenditure Panel Survey (MEPS). MEPS is a set of large-scale surveys of families and individuals, their medical providers, including doctors, hospitals, and pharmacies, and employers across the United States. MEPS is the most complete source of data on the cost and use of health care and health insurance coverage [12]. The analytic focus of MEPS has been directed to the topics of health care access, coverage, cost, and use. Over the past several years, the MEPS data has supported a discernable set of descriptive and behavioral analyses of the US health care system [13]. Institutional Review Board (IRB) approval was waived since MEPS data is publicly available de-identified data.

Study population

The target population was comprised of Hispanic community-dwelling residents with T2D in the US. Patients were included if they: 1) were Hispanic, 2) received any diagnosis codes for T2D (The International Classification of Diseases, Ninth Revision (ICD-9) codes: 250.XX); 3) answered the 12-Item Short-Form Health Survey (SF-12), both physical and mental components; 4) were aged 18 years or older. The MEPS medical conditions files were used to define T2D and comorbidities, and the MEPS full-year consolidated files were employed to define HRQoL and patient characteristics. MEPS contains survey results from SF-12 version 2 (SF-12v2) that consists of physical health composite score and mental health composite scores. The validity and reliability of using these tools among diabetic population have been assessed in a previous study and it is shown to be valid [14].

Study variables

The primary independent variable was the presence of T2D among the Hispanic population. The dependent variable was HRQoL, which was measured using: 1) the SF-12 physical health composite scale (PCS) and 2) the SF-12 mental health composite scale (MCS). As covariate, the following patient's characteristics were included in the analyses: age group (18-44 years, 45-64 years, ≥ 65 years), gender (male, female), Hispanic ethnicity (Mexican / Mexican American / Chicano, Puerto Rican, Cuban / Cuban American, Dominican, Central or South American, Other), region (northeast, midwest, south, west), insurance type (any private, public only, uninsured), marital status (married, unmarried), education level (less than high school, high school, college or higher), poverty level (negative / poor / low, middle, or high), BMI level (underweight / Normal, Overweight, or Obese) and Charlson Comorbidity Index (CCI) (0, 1, or ≥2). The CCI is an extensively used, valid and reliable comorbidity index developed by Charlson et al. in 1987 to predict 1-year mortality for patients enrolled in longitudinal studies [15]. A recent study also found that CCI provides a readily applicable, and valid method for classifying comorbidities and predicting the mortality among the patients with type 2 diabetic nephropathy [16].

Statistical Analyses

Since the MEPS data employs the complex, probabilistic survey design, the sample design effects were used for overall analyses. Chi-square tests were used to test differences in the patients' characteristics by the presence of T2D conditions among the Hispanic population. Multivariate regression was conducted to predict HRQoL by the presence of T2D among the Hispanic population while controlling for described covariates. The α level for statistical significance was used at 0.05. All analyses were performed using SAS 9.3 (SAS Institute, Cary, NC, USA) and STATA / SE 14.1 (STATA Corp., College Station, TX USA).

Results

Table 1 shows the characteristics of the study sample by the presence of T2D among the Hispanic population. A total of 13,933 Hispanic population (unweighted) met the study inclusion criteria who represented 36,440,400 persons Among them, 89.1% did not have any T2D condition (n=12,423), while 10.9% had any T2D conditions (n=1,510). The chi-square tests show that having T2D condition was significantly associated with Hispanic ethnicity ($p<0.001$), age group ($p<0.001$), sex ($p=0.002$), insurance type ($p<0.001$), marital status ($p<0.001$), education level ($p<0.001$), poverty level ($p<0.001$), BMI ($p<0.001$) and CCI ($p<0.001$).

Variable	**Without diabetes** (n=12,423)		**With diabetes** (n=1,510)		**P-value**
	N	**Weighted %**	**N**	**Weighted %**	
Hispanic ethnicity					<0.001
Mexican/Mexican American/Chicano	7,791	60.7%	905	59.7%	
Puerto Rican	982	8.9%	211	13.8%	
Central or South American	2,009	16.5%	173	12.3%	
Other/Multiple	1,641	13.9%	221	14.2%	
Age (years)					<0.001

18-44	8,106	65.3%	235	14.5%	
45-64	3,465	27.5%	772	48.2%	
≥ 65	852	7.2%	503	37.3%	
Sex					<0.001
Male	6,192	52.7%	648	45.0%	
Female	6,231	47.3%	862	55.0%	
Region					0.276
Northeast	1,750	13.7%	260	16.1%	
Midwest	1,040	8.8%	139	10.2%	
South	4,307	37.3%	521	36.9%	
West	5,326	40.2%	590	36.8%	
Insurance					<0.001
Any private	5,170	50.2%	490	38.2%	
Public only	3,188	21.5%	773	48.0%	
Uninsured	4,065	28.3%	247	13.8%	
Marital status					<0.001
Married	5,488	45.4%	832	56.8%	
Unmarried	6,927	54.6%	678	43.2%	
Education					<0.001
Less than high school	4,801	33.0%	781	45.6%	
High school	3,453	28.0%	359	27.0%	
College or higher	3,972	39.0%	349	27.4%	
Poverty level					<0.001
Negative/poor/low (≤ 200%)	6,484	43.0%	903	52.3%	
Middle (200% ~ < 400%)	3,980	33.2%	420	29.8%	
High (≥ 400%)	1,959	23.8%	187	18.0%	
BMI*					<0.001
Underweight/Normal (≤24.9)	3,472	30.9%	204	14.6%	
Overweight (25.0 ~ ≤ 29.9)	4,445	37.1%	492	34.4%	
Obese (≥ 30.0)	3,917	32.0%	767	51.0%	
Charlson Comorbidity Index (CCI)					<0.001
0	4,004	32.9%	333	21.3%	
1	2,426	21.2%	464	29.6%	
≥2	5,993	45.9%	713	49.1%	

Table 1: Sample characteristics of U.S. Hispanic adults by diabetes status (n =13,933, weighted n = 36,440,400)

*BMI (Body Mass Index)

Table 2 shows the SF-12 PCS scores by the presence of T2D in the Hispanic population. Overall SF-12 PCS scores (95%CI) were 45.85 (44.65, 47.05) in Hispanic population with T2D and 51.23 (50.77, 51.68) in Hispanic population without diabetes.

Variable	**Without diabetes** (n=12,423)			**With diabetes** (n=1,510)		
	Mean	**95% CI**		**Mean**	**95% CI**	
Total	**51.23**	**50.77**	**51.68**	**45.85**	**44.65**	**47.05**
Hispanic ethnicity						
Mexican/Mexican American/Chicano	51.50	51.13	51.87	46.13	44.98	47.27
Puerto Rican	50.39	49.55	51.24	45.02	43.73	46.31
Central or South American	52.04	51.51	52.56	46.66	45.38	47.94
Other/Multiple	51.48	50.84	52.13	46.11	44.77	47.45
Age (years)						
18-44	53.55	53.30	53.81	48.18	46.99	49.37
45-64	49.41	49.00	49.83	44.04	42.86	45.22
≥ 65	45.65	44.46	46.84	40.28	38.93	41.63
Sex						
Male	51.99	51.66	52.31	46.61	45.46	47.77
Female	50.93	50.61	51.25	45.56	44.42	46.70
Region						
Northeast	51.54	50.93	52.15	46.17	44.92	47.42
Midwest	50.99	50.10	51.88	45.62	43.98	47.26
South	51.55	51.08	52.01	46.17	45.01	47.34
West	51.48	51.08	51.88	46.11	44.98	47.24
Insurance						
Any private	52.09	51.75	52.43	46.71	45.58	47.84
Public only	49.05	48.48	49.62	43.67	42.40	44.95
Uninsured	52.55	52.13	52.97	47.18	46.00	48.35
Marital status						
Married	51.52	51.18	51.86	46.14	44.97	47.32
Unmarried	51.43	51.10	51.76	46.05	44.93	47.18
Education						
Less than high school	51.20	50.77	51.63	45.83	44.70	46.95
High school	51.31	50.93	51.68	45.93	44.73	47.13
College or higher	51.82	51.46	52.17	46.44	45.27	47.62
Poverty level						

Negative/poor/low (≤ 200%)	51.52	51.18	51.86	46.14	44.97	47.32
Middle (200% ~ < 400%)	51.43	51.10	51.76	46.05	44.93	47.18
High (≥ 400%)	51.52	51.18	51.86	46.14	44.97	47.32
BMI*						
Underweight/Normal (≤24.9)	52.49	52.06	52.91	47.12	45.95	48.28
Overweight (25.0 ~ ≤ 29.9)	52.02	51.72	52.32	46.64	45.49	47.80
Obese (≥ 30.0)	50.05	49.65	50.45	44.68	43.51	45.84
CCI* Score						
0	52.25	51.90	52.60	46.87	45.75	47.99
1	51.05	50.52	51.58	45.67	44.59	46.76
≥2	51.13	50.81	51.45	45.76	44.53	46.99

Table 2: Estimated SF-12 physical health composite scale (PCS) scores by diabetes status in U.S. Hispanic adults (n =13,933, weighted n = 36,440,400).

*BMI (Body Mass Index); *CCI (Charlson Comorbidity Index)

Table 3 shows the SF-12 MCS scores by the presence of T2D in the Hispanic population. Overall, SF-12 MCS scores (95% CI) were 52.52 (51.98, 53.05) in patients without T2D and 49.59 (48.34, 50.76) in the Hispanic population with T2D conditions.

Variable	**Without diabetes** (n=12,423)			**With diabetes** (n=1,510)		
	Mean	**95% CI**		**Mean**	**95% CI**	
Total	**52.52**	**51.98**	**53.05**	**49.59**	**48.34**	**50.76**
Hispanic ethnicity						
Mexican/Mexican American/Chicano	52.78	52.41	53.14	49.85	48.76	50.94
Puerto Rican	51.56	50.66	52.47	48.64	47.21	50.06
Central or South American	52.42	51.69	53.16	49.50	48.21	50.79
Other/Multiple	52.61	51.94	53.28	49.68	48.55	50.82
Age (years)						
18-44	52.66	52.25	53.07	49.74	48.61	50.86
45-64	52.31	51.91	52.72	49.39	48.36	50.42
≥ 65	52.85	51.81	53.89	49.93	48.42	51.43
Sex						
Male	53.30	52.91	53.69	50.37	49.26	51.49
Female	51.83	51.46	52.20	48.91	47.84	49.97

Region						
Northeast	52.41	51.62	53.19	49.48	48.22	50.74
Midwest	51.84	50.94	52.74	48.91	47.65	50.17
South	52.93	52.52	53.34	50.00	48.91	51.10
West	52.48	51.93	53.02	49.55	48.35	50.75
Insurance						
Any private	53.12	52.75	53.49	50.19	49.19	51.20
Public only	50.83	50.12	51.54	47.90	46.62	49.19
Uninsured	53.17	52.65	53.69	50.25	49.00	51.49
Marital status						
Married	53.20	52.86	53.54	50.28	49.14	51.41
Unmarried	52.03	51.61	52.46	49.11	48.05	50.16
Education						
Less than high school	52.17	51.64	52.70	49.25	48.22	50.27
High school	53.34	52.93	53.75	50.42	49.27	51.57
College or higher	52.37	51.90	52.85	49.45	48.25	50.65
Poverty level						
Negative/poor/low (≤ 200%)	51.69	51.32	52.07	48.77	47.67	49.87
Middle (200% ~ < 400%)	53.19	52.64	53.74	50.27	49.11	51.42
High (≥ 400%)	53.37	52.81	53.93	50.45	49.29	51.61
BMI*						
Underweight/Normal (≤24.9)	52.81	52.25	53.37	49.88	48.62	51.14
Overweight (25.0 ~≤ 29.9)	53.19	52.80	53.57	50.26	49.13	51.39
Obese (≥ 30.0)	51.74	51.28	52.20	48.81	47.82	49.80
CCI* Score						
0	53.60	53.23	53.97	50.68	49.54	51.82
1	51.25	50.69	51.80	48.32	47.16	49.47
≥2	52.52	52.08	52.96	49.60	48.51	50.68

Table 3: Estimated SF-12 mental health composite scale (MCS) scores by diabetes status in U.S. Hispanic adults (n =13,933, weighted n = 36,440,400).

*BMI (Body Mass Index); *CCI (Charlson Comorbidity Index)

The findings pertaining to the factors associated with HRQoL in the Hispanic population with T2D from the multiple regression analysis are summarized in Table 4. Two multivariate regression models were conducted to predict HRQoL; one for the SF-12 PCS and the other for the SF-12 MCS. The presence of T2D was

associated with both SF-12 PCS scores and SF-12 MCS scores. First, in the multiple regression analysis of SF-12 PCS scores, the following factors were associated with lower SF-12 PCS scores: the presence of T2D, being Puerto Rican, older age (45 or older compared with 18-44), female gender, having public insurance only, lower education level (less than high school compared with college or higher), lower poverty level (negative/poor/low (≤ 200%), overweight or obese (BMI ≥ 25.0), and CCI score greater than 1. Importantly, the regression coefficient (b) for the presence of T2D was -5.37 (SE=0.60, p<0.001); this displays that SF-12 PCS scores in the Hispanic population with T2D decreased by 5.37 scores more than those without T2D, controlling covariates. Second, in the multiple regression analysis on SF-12 MCS scores, the presence of T2D, being Puerto Rican, female gender, having public insurance only, unmarried, lower education (less than high school compared with high school), lower poverty level (negative/poor/low (≤ 200%), obese (BMI ≥ 30.0), and CCI score greater than 1 were associated with lower SF-12 MCS scores. Importantly, the regression coefficient (b) for the presence of T2D was -2.93 (SE: 0.54, p<0.001), meaning that SF-12 MCS scores in the Hispanic population with T2D decreased by 2.93 scores more than those without T2D, controlling for other covariates.

Variable	**SF-12 PCS**			**SF-12 MCS**		
	Coefficient	**SE**	**p-value**	**Coefficient**	**SE**	**p-value**
Diabetes						
No	Reference					
Yes	-5.37	0.60	<0.001	-2.93	0.54	<0.001
Hispanic ethnicity						
Mexican/Mexican American/Chicano	Reference					
Puerto Rican	-1.10	0.48	0.024	-1.21	0.50	0.016
Central or South American	0.54	0.33	0.109	-0.35	0.41	0.393
Other/Multiple	-0.02	0.40	0.967	-0.17	0.37	0.658
Age (years)						
18-44	Reference					
45-64	-4.14	0.25	<0.001	-0.35	0.26	0.185
≥ 65	-7.90	0.61	<0.001	0.19	0.61	0.758
Sex						
Male	Reference					
Female	-1.05	0.21	<0.001	-1.47	0.25	<0.001
Region						
Northeast						
Midwest	-0.55	0.59	0.355	-0.57	0.60	0.342
South	0.01	0.36	0.987	0.52	0.45	0.251
West	-0.06	0.40	0.882	0.07	0.50	0.887

Insurance						
Any private	Reference					
Public only	-3.04	0.36	<0.001	-2.29	0.40	<0.001
Uninsured	0.46	0.24	0.054	0.05	0.34	0.879
Marital status						
Married	Reference					
Unmarried	-0.09	0.23	0.698	-1.17	0.26	<0.001
Education						
Less than high school	Reference					
High school	0.11	0.29	0.714	1.17	0.31	<0.001
College or higher	0.62	0.27	0.024	0.20	0.37	0.584
Poverty level						
Negative/poor/low (≤ 200%)	Reference					
Middle (200% ~ < 400%)	0.69	0.25	0.005	1.50	0.31	<0.001
High (≥ 400%)	1.43	0.33	<0.001	1.68	0.38	<0.001
BMI*						
Underweight/Normal (≤24.9)	Reference					
Overweight (25.0 ~ ≤ 29.9)	-0.47	0.25	0.059	0.38	0.34	0.265
Obese (≥ 30.0)	-2.44	0.27	<0.001	-1.07	0.35	0.003
CCI* Score						
0	Reference					
1	-1.20	0.28	<0.001	-2.36	0.32	<0.001
≥2	-1.12	0.22	<0.001	-1.08	0.28	<0.001
Constant	55.81	0.54	<0.001	54.55	0.60	<0.001

Table 4: Multivariate Regression Analysis for Hispanic ethnicity and other factors associated with health-related quality of life among U.S. Hispanic adults (n =13,933, weighted n = 36,440,400).

*BMI (Body Mass Index); *CCI (Charlson Comorbidity Index)

Compared with the male population for SF- 12 PCS and SF-12 MCS, SF-12 PCS and SF-12 MCS of the female population scores were lower (b=-1.05, SE=0.21, p<0.001; b=-1.47, SE=0.25, p<0.001, respectively). Among insurance types, the population with public insurance has both lower SF-12 PCS scores (b=-3.04, SE=0.36, p<0.001) and SF-12 MCS scores (b=-2.29, SE=0.40, p<0.001) compared with the population with private insurance. Unmarried individuals had both lower SF-12 PCS scores (b=-0.09, SE=0.23, p<0.698) and SF-12 MCS scores (b=-1.17, SE=0.26, p<0.001) than married, but this is a significant predictor only for SF-12

MCS scores. Charlson Comorbidity Index (CCI) scores were also significantly related to SF-12 PCS and MCS scores. Overall, as CCI scores decreased, SF-12 PCS and MCS scores were lower. The presence of comorbidity lowered both SF-12 PCS scores (b=-1.2, SE=0.28, p<0.001) and SF-12 MCS scores (b=-2.63, SE=0.32, p<0.001). Hispanic ethnicity and region were not associated with either SF-12 PCS scores or SF-12 MCS scores.

Dicussion

HRQoL has been used to quantify a patient's overall well-being, including physical, mental, social and psychological components. This study focused on utilizing the SF-12 to measure the mental and physical components of HRQoL in adult Hispanics in the U.S. The SF-12 has been found to be a reliable and valid form of HRQoL measure and continues to be one commonly used HRQoL [17]. The main objective of this study was to determine if the presence of T2D is related to decreased HRQoL in Hispanic adults in the US, as well as what factors are associated with HRQoL within the Hispanic population living with T2D. The results indicated that the factors that are associated with decreased HRQoL among diabetic Hispanic adults in the U.S. included presence of T2D, being Puerto Rican, female gender, having public insurance only, lower education, lower poverty level, obesity, and more comorbidities. This study is one of few studies that focuses on the relation between HRQoL and the presence of T2D among U.S. Hispanic adults.

The results demonstrated a negative association between HRQoL and the presence of T2D, as the presence of T2D negatively affected both mental and physical HRQoL domains. This is semi-consistent with previous research, as Graham et al. also demonstrated that HRQoL was decreased in Hispanics (specifically Mexican-Americans) living with T2D [9]. It is important to note that the variances in HRQoL in Graham et al. were associated with only the physical aspect of the SF-36 [9]. Other studies have shown that patients living with T2D have worse overall health compared to those living without the disease [18-20]. This supports our study, as all measures of HRQoL were negatively affected by the presence of T2D.

The presence of comorbidities related to T2D has been linked to decreased HRQoL [9, 21-23]. Similar to a study conducted by Hill-Briggs et al. our results demonstrated that comorbidity disease index was significantly related to diminished HRQoL [20]. Hill-Briggs et al. focused solely on HRQoL in African-Americans [23]. The results from another study supported our findings that the presence of T2D with comorbidities is correlated with lower HRQoL scores [20]. Kim et al. found that HRQoL was the highest when no comorbidities were present, and significantly decreased as the number of comorbidities increased [24]. It should be noted that Kim et al. focused on patients with T2D who were from South Korea.

The same study presented that male gender is associated with higher HRQoL, compared to females ($t = 6.367$, $p < 0.001$) [24]. This is similar to our study, in which being male was significantly associated with higher HRQoL. Both SF-12 PCS and MCS were lower in the female population (b=-1.05, SE=0.21, p<0.001; b=-1.47, SE=0.25, p<0.001, respectively). Another study concluded comparable results, showing that female diabetic patients had overall poorer scores for physical functioning and psychological well-being than male patients [25]. Hill-Briggs et al. had conflicting results when compared to our study, showing no significant differences in SF-36 scores based on gender [23].

Previous studies revealed that the interventions to improve HRQoL in people with diabetes includes disease control [26], changes in insulin delivery methods (switching from syringes to pens) [27], educational programs which incorporate diabetes-specific coping skills [28,29], and a weight-lowering program targeting overweight diabetic individuals [30]. The factors that were found to be associated with decreased HRQoL in this study would help identify the most vulnerable population who need more attention and support to access those interventions.

HRQoL should always be quantified by using a valid and reliable measurement to increase the legitimacy of the information collected. The MCS and PCS of the SF-12 have demonstrated the characteristic of internal consistency and reliability ($\alpha > 0.80$) [17]. Both components have been revealed to be reliable and valid in assessing HRQoL in the previous 2003–2004 MEPS data [19]. Our study used a dependable and recognized HRQoL measure.

However, this study did present several limitations. For instance, cross-sectional studies cannot establish causation. Self- or proxy reporting of the medical conditions of the MEPS can create recall bias. Recognizing possible bias in this study is critical to better understanding its limitations. The mental component centered on the relationship between HRQoL and comorbid depression and anxiety disorders in Hispanic patients living with T2D. This is an important limitation of this study because it excludes other mental disorders that could be associated with T2D in the Hispanic population. Because this study used the MEPS data that collected information from the general population, a generic HRQoL tool was used, not a diabetes-specific HRQoL questionnaire. Finally, our results could have been influenced by CCI, as some comorbidities could have been omitted. Regardless of these limitations, this study was still capable of presenting data on the HRQoL of Hispanic Americans with T2D.

Conclusion

In conclusion, we have presented valuable data on the association between T2D and the HRQoL among the Hispanic population in the US. In this study we utilized reliable data measures, SF-12 PCS and SF-12 MCS to display the relationship between T2D and HRQoL. The results of our study showed that the presence of T2D was inversely associated with HRQoL among the Hispanic population in the US. This is a very important topic to study because the Hispanic population is one of the fastest-growing in the US. This study opens up more opportunities for research to be conducted on other comorbidities and how they affect HRQoL in the Hispanic population living in the US. There must also be more research conducted in the area of how access to health care of different ethnicities affects HRQoL and overall health outcomes. This study was conducted with the purpose of improving care for Hispanic patients living with T2D in the US, improvement in overall HRQoL, improvement in the health outcomes for Hispanic patients, and to address the issues associated with access and use of health care resources in underserved ethnic groups in the US.

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Conflicts of Interest

The authors declare no conflict of interest.

Ethics Approval

Institutional Review Board (IRB) approval was waived since MEPS is publicly available de-identified dataset

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