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ORIGINAL PAPER

PREDICTORS OF HEALTH-RELATED QUALITY OF LIFE AMONG TYPE 2 DIABETES MELLITUS OUTPATIENTS IN CAN THO CITY, VIETNAM

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Abstract

Introduction. Health-related quality of life (HRQoL) is a crucial aspect in diabetes research. There is a lack of research on the HRQoL of patients with type 2 diabetes (T2D) in the Mekong Delta region, especially in Can Tho City, Vietnam.
The objective of the study was to to determine HRQoL score and elicit some related factors of T2D patients in O Mon district, Can Tho city, in 2019-2020.
Material and methods. A cross-sectional study was conducted in patients diagnosed with T2D and currently managed at health stations in O Mon district, Can Tho city, from December 31st, 2019, to September 30th, 2020. Data was collected through direct interviews with study participants, using short form 36 Vietnamese version including 8 scales (physical functioning, role-physical, bodily pain, general health, social functioning, role-emotional, mental health, vitality).
Results. HRQoL mean scores of 8 health scales ranged between 45.31 and 81.72. Social functioning had the highest score, and general health had the

Résumé

Prédicteurs de la qualité de vie liée à la santé chez les patients ambulatoires atteints de diabète sucré de type 2 dans la ville de Can Tho, au Vietnam

Introduction. La qualité de vie liée à la santé (HRQoL) est un aspect crucial de la recherche sur le diabète. Il y a un manque de recherche sur la HRQol des patients atteints de diabète de type 2 (DT2) dans la région du delta du Mékong, en particulier dans la ville de Can Tho, au Vietnam.
L'objectif de l'étude était de déterminer le score HRQoL et d'élucider certains facteurs connexes des patients atteints de DT2 dans le district d'O Mon, ville de Can Tho, en 2019-2020.
Matériel et méthodes. Une étude transversale a été menée chez des patients diagnostiqués avec le DT2 et actuellement pris en charge dans les postes de santé du district d'O Mon, ville de Can Tho, du 31 décembre 2019 au 30 septembre 2020. Les données ont été recueillies par le biais d'entretiens directs avec les participants à l'étude, en utilisant la forme courte 36 version

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lowest score. Older individuals, retirees, or housewives, those with lower economic status, longer treatment duration, comorbidities and complications, insulin injections, and poor glycemic control had a lower quality of life mean scores.

Conclusions. The study found that patients with T2D had the lowest HRQoL. The district health center in Can Tho should provide education and guidance for patients with low quality of life scores. Healthcare professionals should pay attention to this group of patients, and to ensure appropriate care.

Keywords: health-related quality of life, type 2 diabetes mellitus, SF-36, Vietnam.

List of abbreviations

HRQoL – health-related quality of life
T2D – diabetes type 2
QoL – quality of life
SD – standard deviation

vietnamienne comprenant 8 échelles (fonctionnement physique, rôle-physique, douleur corporelle, santé générale, fonctionnement social, rôle-émotionnel, santé mentale, vitalité).

Résultats. Les scores moyens HRQoL de 8 échelles de santé variaient entre 45,31 et 81,72. Le fonctionnement social avait le score le plus élevé et la santé générale avait le score le plus bas. Les personnes plus âgées, les retraités ou les femmes au foyer, les personnes ayant un statut économique inférieur, une durée de traitement plus longue, des comorbidités et des complications, des injections d'insuline et un mauvais contrôle glycémique avaient des scores moyens de qualité de vie inférieurs.

Conclusions. L'étude a révélé que les patients atteints de DT2 avaient la HRQoL la plus faible. Le centre de santé du district de Can Tho devrait fournir une éducation et des conseils aux patients dont les scores de qualité de vie sont faibles. Les professionnels de la santé doivent prêter attention à ce groupe de patients et assurer des soins appropriés.

Mots-clés: qualité de vie liée à la santé, diabète sucré de type 2, SF-36, Vietnam.

Introduction

Diabetes is a chronic disease characterized by high blood glucose levels. Hyperglycemia is a common effect of uncontrolled diabetes and can cause damage to many of the body's systems[1] . In 2019, diabetes was responsible for 1.5 million deaths worldwide, and 48% of all diabetes-related deaths occurred before the age of 70 years[2]. Furthermore, 460,000 kidney disease deaths were caused by diabetes, and raised blood glucose levels caused around 20% of cardiovascular deaths[2]. From 2000 to 2019, there was a 3% increase in age-standardized mortality rates from diabetes[2]. In lower-middle-income countries, the mortality rate because of diabetes increased by 13%[2]. In Vietnam, The Ministry of Health reported that in 2019[3], there were 3.5 million Vietnamese people living with diabetes, with a potential doubling of this number by 2045. Among them, only 29% were receiving treatment, while 69% remained undiagnosed. The number of people with diabetes in Vietnam increased by 43% in 2019 to around 5 million cases in 2022[3].

According to the Centers for Disease Control and Prevention (US)[4], the concept of quality of life (QOL) is a broad term that encompasses many aspects, including both positive and negative aspects of life. While health is an important part of QoL, other factors such as work, housing, education, culture, and spirituality are also important. QoL is synonymous with optimal comfort, where the main concern is to create a state of physical and mental comfort and increase leisure time[5]. QoL is characterized by 12 features, expanded by William Bell[5], including personal physical safety, economic prosperity, legal justice, national security, health care coverage, mental happiness, social participation, educational and medical equality, cultural life quality, civil liberties, technical environmental quality, and living environment quality and pollution control.

Various studies worldwide have explored the health-related quality of life (HRQoL) of type 2 diabetes (T2D) patients using different instruments. The results of some studies have demonstrated differences in HRQoL scores among various sociodemographic and clinical factors such as gender, occupation, education, duration of disease, and comorbidities related to cardiovascular, renal, and retinal complications[6–11]. In Vietnam, despite several community intervention programs and projects aimed at enhancing the quality of diabetes management and treatment, there are only a few studies conducted on the HRQoL of T2D patients[12–16]. Specifically, there is a lack of research on the HRQoL of T2D patients in the Mekong Delta region, especially in Can Tho City, in recent years.

The objective of the study was to determine the mean HRQoL scores in T2D patients and to identify associated factors in Can Tho City in 2019-2020.

Material and methods

Study setting

A cross-sectional study was conducted in patients diagnosed with T2D and currently managed in health stations in O Mon district, Can Tho city, from December 31st, 2019, to September 30th, 2020. The inclusion criteria were patients diagnosed with T2D and currently managed at the O Mon district Health Center, with permanent residency in the study's commune/ward and willingness to participate in the study. The exclusion criteria included individuals with communication difficulties and those who left the study area during the study period. The sampling method involved selecting all T2D patients currently managed in health stations in the wards of O Mon district, Can Tho city, between 2019-2020.

Data were collected through direct interviews with study participants, using a pre-designed questionnaire. Fourth-year preventive medical students were trained in interview methods and questionnaire administration. A surveillance officer from the Department of Epidemiology, Can Tho University of Medicine and Pharmacy, provided direct training and oversaw the data collection process within the community. The procedures included greeting and introducing the study's purpose to the participants, inviting them to answer the interview questions. Next, the participants were interviewed using the pre-designed questionnaire. During the interview, participants could decline to answer any questions they did not want to or could stop participating in the study at any time they wished. Additionally, the investigators observed the medical records and prescription of patients with T2D, requested permission to record relevant information, and documented it on the data collection form.

Questionnaire

The questionnaire consists of two parts. The first part includes questions regarding the demographic information of the study subjects, such as age (<50 years old, 50-60 years old, 61-70 years old, >70 years old), ethnicity (kinh, other), religion (non-religious, religious), highest educational level (no schooling/incomplete primary education, graduated from primary school, graduated from secondary school or higher), main occupation in the past 12 months (farmer, trader, homemaker, retired, other), living arrangement (living alone/living with friends, living with family), household economic status (poor, near-poor, not poor), health insurance status (yes, no).

In the second part, the quality of life was evaluated using the SF-36 HRQoL assessment tool, consisting of two components of health: physical health and mental health. Physical health includes 4 scales of health: Physical functioning (10 questions), Role-physical (4 questions), Bodily pain (2 questions), and General health (6 questions). Mental health includes 4 scales of health: Vitality (4 questions), Social functioning (2 questions), Role-Emotional (3 questions), and Mental health (5 questions). The questions were assessed using "yes/no" responses or the Likert scale. The results were then summarized and converted into a scale ranging from 0 (death) to 100% (perfect health) [17,18].The score of physical components of health and mental component of health was calculated by averaging the scores of its respective items. The overall quality of life score was calculated by averaging the scores of physical and mental components of health. Physical health, Mental health, and overall quality of life were classified into 3 levels: poor (average score less than or equal to 25), moderate (average score from 25 to 75), and good (average score greater than 75).

Data analysis

Data were entered and analyzed using SPSS software version 18.0. Quantitative variables were presented as mean values and standard deviations, medians, minimum and maximum values. Categorical variables were presented as frequency and percentages (%). T-tests (or Mann-Whitney, if applicable), ANOVA (or Kruskal-Wallis, if applicable) were used to investigate the relationship between participant characteristics and quality of life measures. Variables with a significance level of $p < 0.1$ in univariate analysis were included in multivariate analysis, using the Enter method. Significant differences were determined at a significance level of $p < 0.05$.

Results

The information on the sociodemographic characteristics, clinical features, paraclinical characteristics among study participants are presented in Table 1. Most participants were female (71.5%), aged between 61 and 70 years (41.8%), of the Kinh ethnic group (98.1%), predominantly non-religious (39.9%), and had completed at least secondary school education (41.1%). Most of the study participants were retired (20.3%) or housewives (27.8%), had a non-poor economic status (86.1%), lived with their families (96.8%), and had health insurance coverage (93.0%).

Table 1. Sociodemographic, clinical features, paraclinical of the study population (n=158)

Characteristics		*Frequency (n)*	*Percent (%)*
Sociodemographic characteristics			
Gender	Men	45	28.5
	Women	113	71.5
Age group	< 50	12	7.6
	50 – 60	53	33.5
	61 – 70	66	41.8
	> 70	27	17.1
Ethnicity	Kinh	155	98.1
	Other	3	1.9
Religion	None	63	39.9
	Following a religion	95	60.1
Education level	Not completed primary education	51	32.3
	Completed primary education	42	26.6
	Completed secondary education or higher	65	41.1
Occupation	Business person	29	18.4
	Farmer	25	15.8
	Retired	32	20.3
	Housewife	44	27.8
	Other	28	17.8
Economic classification	Poor	12	7.6
	Near–poor	10	6.3
	Non–poor	136	86.1
Living status	Living alone/living with friends	5	3.2
	Living with family	153	96.8
Health insurance	Yes	147	93.0
	No	11	7.0
Clinical features, paraclinical characteristics			
Duration of treatment	< 5 years	80	50.6
	5 – 10 years	47	29.7
	>10 years	31	19.6
Complications	No	54	34.2
	Yes	104	65.8
Dietary regimen	No	44	27.8
	Yes	114	72.2
Use of injectable insulin	No	129	81.6
	Yes	29	18.4
Comorbidities	No	50	31.6
	Yes	108	68.4
Blood sugar level	Good	26	16.5
	Acceptable	37	23.4
	Poor	95	60.1

Regarding physical health, the highest mean score was observed for bodily pain (70.59 ± 24.71), while in mental component of health, the highest mean score was found for social functioning (81.72 ± 19.83), as presented in Table 2. Most study participants had a good to moderate quality of life in terms of physical health, mental health, and overall quality of life (Figure 1).

The univariate analysis included all variables related to demographics, occupational characteristics, household economic classification, cohabitation status, and participation in health insurance (Tables 3

Table 2. Description of quality of life based on physical and mental health scores (n=158)

Components of health	*Mean±SD*	*Median*	*Min*	*Max*
Physical health				
Physical functioning (PF)	57.75±26.55	55.0	0	90
Role-physical (RP)	53.48±44.57	75.0	0	100
Bodily pain (BP)	70.59±24.71	67.5	10	100
General health (GH)	45.31±19.37	45.83	0	91.67
Mental health				
Social functioning (SF)	81.72±19.83	87.5	25	100
Role-Emotional (RE)	54.00±45.24	66.67	0	100
Vitality (VT)	62.91±18.68	65.0	20	100
Mental health (MH)	69.62±17.52	72.0	12	100

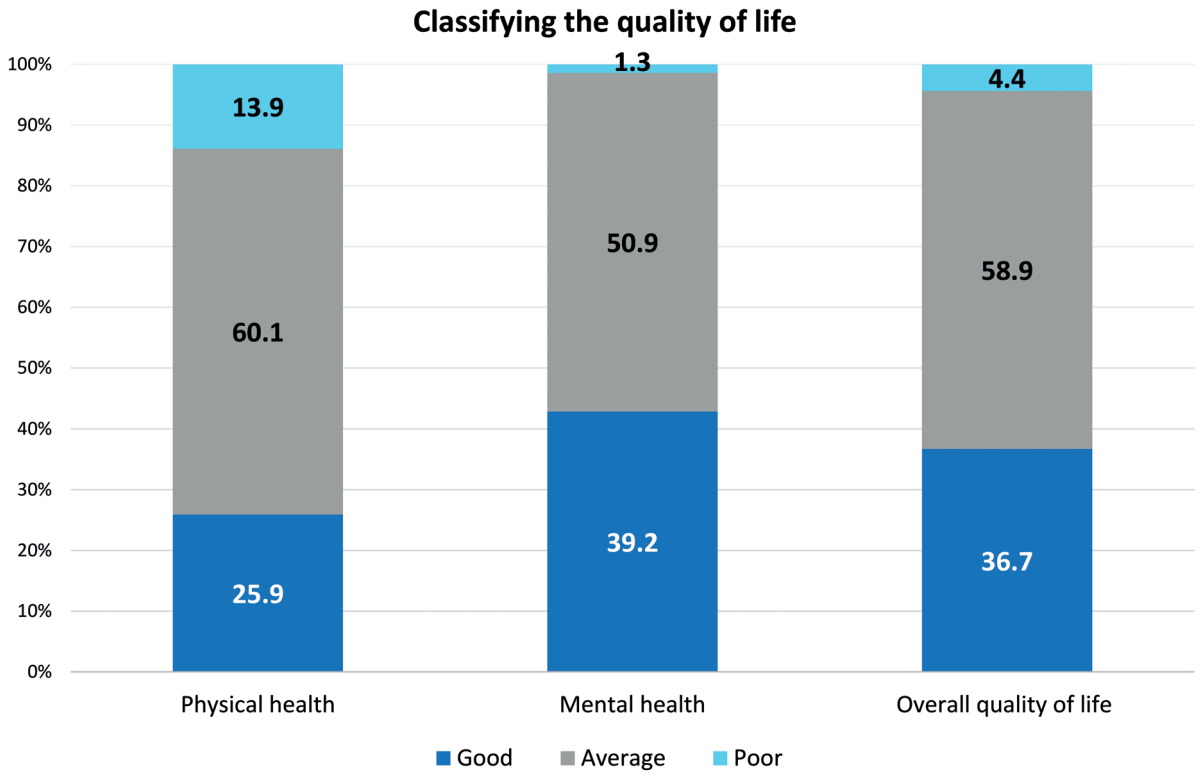


Figure 1. Quality of life in terms of physical health, mental health, and overall quality of life (n=158).

and 4). Only variables that were found to have significant differences were included in the multivariate regression. The results of the multivariate regression analysis on factors related to physical health are presented in Table 5. Factors associated with physical functioning include age group, occupation, complications, use of injected insulin, and comorbidities. Factors related to role-physical include occupation, complications, comorbidities, and blood sugar levels. Factors associated with bodily pain include household economic status, duration of T2D treatment, complications, comorbidities, and blood sugar levels. Factors associated with general health include duration of T2D treatment and comorbidities. The results of the multivariate regression analysis on factors related to mental health are presented in Table 6. The factors related to social functioning were found to be comorbidity and blood glucose levels. The factors related to role-emotional were occupation, duration of treatment, comorbidity, blood glucose levels. The factors related to vitality were age group and family economy. The factor related to mental health was family economy.

Table 3. The relationship between sociodemographic characteristics, clinical features, paraclinical characteristics, and physical health (n=158)

Characteristics		*Physical functioning*	*P-value*	*Role-physical*	*P-value*	*Bodily pain*	*P-value*	*General health*	*P-value*
Gender	Men	58.44±28.28	0.186*	52.78±44.66	0.954*	68.56±23.40	0.451*	47.04±22.47	0.521†
	Women	53.27±25.80		53.76±44.72		71.39±25.26		44.62±18.05	
Age group	< 50	65.00±25.85	< 0.001**	64.58±44.54	**0.032****	73.33±24.06	0.093**	51.39±19.89	0.656‡
	50 – 60	65.47±23.23		64.62±42.86		77.17±24.50		45.99±19.68	
	61 – 70	51.36±25.00		50.00±44.29		66.70±25.01		44.38±19.12	
	> 70	37.41±26.58		35.19±43.44		65.93±22.91		43.52±19.62	
Occupation	Farmer	70.40±19.09	< 0.001**	69.00±40.36	0.051**	60.00±24.99	0.188**	53.67±18.17	0.053‡
	Businessperson	61.55±25.60		66.38±40.24		80.17±19.79		48.85±16.70	
	Housewife	54.89±23.56		48.30±45.24		70.17±26.01		43.46±18.60	
	Retired	37.19±24.29		39.06±43.50		65.39±22.21		39.32±19.94	
	Other	53.57±29.80		50.89±47.86		68.66±28.15		43.90±21.50	
Education level	Not completed primary education	48.43±25.97	**0.042****	46.08±44.55	0.223**	70.59±26.53	0.939**	42.08±18.99	0.337‡
	Completed primary education	53.81±25.42		51.79±47.30		69.70±23.54		46.13±15.60	
	Completed secondary education or higher	60.31±26.91		60.38±42.36		71.15±24.34		47.31±21.67	
Economic classification	Non-poor	56.47±26.24	0.127**	58.46±43.80	**0.003****	73.57±23.97	**0.001****	46.38±19.43	0.071‡
	Near-poor	49.50±25.22		17.50±31.29		53.25±25.63		45.41±18.26	
	Poor	39.58±27.84		27.08±41.91		52.25±18.29		32.99±16.33	
Health insurance	Yes	54.22±27.04	0.493*	53.57±44.57	0.856*	70.24±24.71	0.539**	45.24±19.53	0.873†
	No	61.82±18.07		52.27±46.71		75.23±25.38		46.21±17.82	
Living status	Living with family	54.74±26.93	0.877*	54.41±44.44	0.182*	70.56±24.67	0.908*	45.15±19.15	0.583†
	Living alone/ living with friends	55.00±10.00		25.00±43.30		71.50±28.97		50.00±27.48	
Duration of treatment	< 5 years	59.63±24.83	0.092**	59.38±44.54	0.232**	74.91±24.99	0.05**	48.96±17.13	**0.028**‡
	5 – 10 years	48.94±28.15		46.81±44.11		64.15±24.72		43.62±21.46	
	>10 years	50.97±26.81		48.39±44.69		69.19±22.29		38.44±19.89	
Complications	No	69.63±19.20	**< 0.001***	80.56±33.88	**< 0.001***	83.29±19.65	**< 0.001***	52.70±14.28	**< 0.001**†
	Yes	47.02±26.61		39.42±43.05		63.99±24.57		41.47±20.57	
Dietary regimen	No	54.32±24.75	0.800*	53.98±45.73	0.853*	71.31±23.02	0.956*	48.39±17.75	0.215†
	Yes	54.91±27.31		53.29±44.31		70.31±25.42		44.12±19.90	
Use of injectable insulin	No	58.10±25.24	**0.002***	57.17±43.77	**0.044***	71.94±25.03	0.116*	46.41±18.69	0.129†
	Yes	39.83±27.50		37.07±45.13		64.57±22.65		40.37±21.80	
Comorbidities	No	62.80±23.69	**0.010***	69.50±38.56	**0.004***	84.95±18.40	**< 0.001***	52.25±18.16	**0.002**†
	Yes	51.02±27.07		46.06±45.36		63.94±24.49		42.09±19.14	
Blood sugar level	Good	61.54±26.56	0.102**	66.35±45.25	**0.007****	81.54±25.39	**0.013****	48.88±22.66	0.217‡
	Acceptable	59.05±24.46		66.89±40.42		72.64±21.83		48.42±15.72	
	Poor	51.21±26.97		44.74±44.20		66.79±24.83		43.11±19.57	

**Mann – Whitney U – Test, **Kruskal – Wallis H – Test, †Independent Sample T – Test, ‡ One Way ANOVA.*

Table 4. The relationship between sociodemographic characteristics, clinical features, paraclinical characteristics and mental health (n=158)

Characteristics		*Social functioning*	*P value*	*Role-Emotional*	*P value*	*Vitality*	*P value*	*Mental health*	*P value*
Gender	Men	79.72±22.50	0.591*	54.07±45.11	0.962*	65.11±20.66	0.352†	72.09±18.16	0.265†
	Women	82.52±18.72		53.98±45.50		62.04±17.86		68.64±17.24	
Age group	< 50	83.33±14.43	0.331**	61.11±44.57	0.140**	67.08±16.71	**0.027‡**	71.67±10.16	0.973‡
	50 – 60	84.43±20.20		64.15±44.26		67.08±17.47		69.89±17.23	
	61 – 70	81.25±19.76		49.49±45.76		62.35±19.06		69.15±19.69	
	> 70	76.85±21.29		41.98±43.94		54.26±18.69		69.33±15.61	
Occupation	Farmer	86.50±20.70	**0.021****	73.33±38.49	**0.043****	67.60±18.43	0.287‡	81.92±14.88	**0.001‡**
	Businessperson	87.50±15.67		65.52±43.17		65.52±17.39		68.83±14.98	
	Housewife	83.81±18.00		47.73±44.55		63.86±18.58		67.27±18.67	
	Retired	75.39±20.45		41.67±44.80		59.84±17.62		69.75±14.26	
	Other	75.45±22.43		48.81±49.26		50.04±21.05		63.00±19.28	
Education level	Not completed primary education	80.88±19.74	0.778**	52.29±48.19	0.961**	57.75±20.33	0.053‡	66.98±18.50	0.299‡
	Completed primary education	82.14±17.71		55.56±44.58		66.07±14.55		72.67±13.80	
	Completed secondary education or higher	82.12±21.42		54.36±43.93		64.92±19.13		69.72±18.76	
Economic classification	Non-poor	83.64±19.16	**0.006****	57.11±44.98	**0.035****	65.85±17.77	**< 0.001‡**	71.68±17.18	**0.001‡**
	Near-poor	68.75±15.87		20.00±35.83		47.00±12.06		56.80±10.80	
	Poor	70.83±24.03		47.22±45.97		42.92±14.69		57.00±16.98	
Health insurance	Yes	81.21±20.29	0.423*	54.20±45.03	0.834*	62.79±18.96	0.765†	69.52±17.95	0.801†
	No	88.64±10.39		51.52±50.25		64.55±15.08		70.91±10.60	
Living status	Living with family	81.70±19.92	0.902*	54.25±45.38	0.568*	63.17±18.79	0.338†	69.96±17.58	0.177†
	Living alone/ living with friends	82.50±18.96		46.67±44.72		55.00±14.58		59.20±12.77	
Duration of treatment	< 5 years	84.84±17.98	0.179**	65.00±43.38	0.007**	65.75±17.59	0.140‡	72.10±16.30	0.171‡
	5 – 10 years	78.99±19.87		40.43±44.47		59.26±18.36		66.21±17.59	
	>10 years	77.82±23.43		46.24±45.28		61.13±21.20		68.39±19.90	
Complications	No	90.05±13.60	**< 0.001***	75.31±40.01	**< 0.001***	70.56±16.42	**< 0.001†**	72.74±17.48	0.107†
	Yes	77.40±21.20		42.95±42.99		58.94±18.63		68.00±17.40	
Dietary regimen	No	81.82±18.18	0.786*	50.76±45.74	0.606*	63.98±17.64	0.657†	69.09±17.00	0.814†
	Yes	81.69±20.51		55.26±45.19		62.50±19.13		69.82±17.79	
Use of injectable insulin	No	83.04±19.75	**0.039***	56.85±44.57	0.103*	64.03±18.40	0.112†	69.67±17.86	0.935†
	Yes	75.86±19.46		41.38±46.85		57.93±19.43		69.37±16.22	
Comorbidities	No	89.00±16.30	**< 0.001***	68.00±43.10	**0.007***	69.10±17.57	**0.004†**	71.76±16.94	0.298†
	Yes	78.36±20.48		47.53±44.93		60.05±18.56		68.63±17.77	
Blood sugar level	Good	87.98±16.76	0.084**	66.67±45.22	**0.027****	64.62±20.05	0.463‡	72.46±18.77	0.517‡
	Acceptable	85.14±16.88		65.77±41.93		65.54±17.35		70.81±15.66	
	Poor	78.68±21.18		45.96±45.14		61.42±18.85		68.38±17.91	

**Mann – Whitney U – Test, **Kruskal – Wallis H – Test, †Independent Sample T – Test, ‡ One Way ANOVA.*

Table 5. Multivariate regression analysis of factors related to physical health (n=158)

Factors	*Physical functioning*		*Role–physical*		*Bodily pain*		*General health*	
	β	*P value*	β	*P value*	β	*P value*	β	*P value*
Age	–7.52	**0.001**	–6.63	0.078	–2.84	0.152	–	–
Occupation	8.68	**0.017**	13.70	**0.030**	–	–	5.55	0.052
Education level	3.64	0.092	–	–	–	–	–	–
Family income	–	–	–9.58	0.081	–7.34	**0.015**	–3.63	0.159
Duration of treatment	–3.50	0.148	–	–	–4.54	**0.04**	–5.72	**0.003**
Complications	–15.32	**<0.001**	–29.10	**<0.001**	–10.05	**0.008**	–6.19	0.054
Use of injectable insulin	–13.90	**0.003**	–13.70	0.08	–	–	–	–
Comorbidities	–8.00	**0.045**	–14.23	**0.034**	–19.78	**<0.001**	–9.69	**0.003**
Blood sugar level	–	–	–12.05	**0.003**	–6.35	**0.004**	–	–

Note: All factors were included in the univariate analysis, and only variables that were found to have significant differences were included in the multivariate regression. Therefore, variables with cells marked as "-" indicate no significance, while those with values indicate significance in the univariate analysis.

Table 6. Multivariate regression analysis of factors related to mental health (n=158)

Factors	Social functioning		Role–Emotional		Vitality		Mental health	
	β	P value	β	P value	β	P value	β	P value
Age	–	–	–	–	–3.32	**0.042**	–	–
Occupation	2.68	0.365	14.97	**0.023**	–	–	2.59	0.337
Education level	–	–	–	–	0.45	0.785	–	–
Family income	–5.08	0.057	–3.55	0.547	–10.13	**<0.001**	–8.52	**<0.001**
Duration of treatment	–	–	–9.08	**0.035**	–	–	–	–
Complications	–7.45	**0.032**	–20.53	**0.008**	–5.84	0.06	–	–
Use of injectable insulin	–5.44	0.156	–	–	–	–	–	–
Comorbidities	–3.00	0.051	–7.92	**0.021**	–2.67	0.054	–	–
Blood sugar level	–4.52	**0.022**	–10.88	**0.013**	–	–	–	–

Note: All factors were included in the univariate analysis, and only variables that were found to have significant differences were included in the multivariate regression. Therefore, variables with cells marked as "-" indicate no significance, while those with values indicate significance in the univariate analysis.

Discussion

The results of our study show that the average score for eight components of HRQoL ranged from 45.31 to 81.72, with the lowest score observed in General Health and the highest in Social Functioning. These findings are consistent with the study by Tran Ngoc Hoang conducted in 2014 in Ho Chi Minh City, where the lowest scores were 41.09 for General Health and the highest scores were 61.63 for Social Functioning[19]. However, our results differ from the study by Gramham conducted in 2007 in the US, which reported the lowest and highest scores as 60.3 for General Health and 81.5 for Social Functioning, respectively[20]. It is important to note that the differences in scores between our study and others may be attributed to various factors such as differences in study population, sample size, study design, and measurement tools used. Nonetheless, our study provides valuable information on the HRQoL of patients with T2D in the O Mon district of Can Tho city.

Our study results have identified some factors related to the HRQoL in patients with T2D. Age was found to affect the components of health related to physical functioning and vitality. Specifically, as age increases, the quality of life related to physical functioning and vitality decreases. This can be explained by the fact that as people age, physical activity and exercise decrease, and older people tend to be less active. In terms of vitality, the older the age, the lower the vitality, which is consistent with reality. Our study results also support the findings of Hoang Thi Tuyet Nhi's study in 2018, which showed that older age was associated with lower quality of life[16].

Our study highlights the differences in quality of life among different occupational groups. Those currently employed (such as farmers, workers, and merchants) have a lower quality of life in terms of

physical functioning, role-physical, and role-emotional compared to retirees or homemakers. Patients in the retiree and homemaker groups have lower quality of life regarding physical functioning, which may be due to their current job situation no longer involving much physical activity, and their age being a factor as well, as advancing age can affect physical health and limit physical activity. A study by Mohammad in Iran in 2017 similarly showed that those with employment and those under 50 years old had higher quality of life scores than other groups[21]. The explanation for why the currently employed group has a higher quality of life than the retiree and homemaker groups in terms of mental health limitations is that occupational groups have lower quality of life regarding mental health compared to those who are retired or self-employed. Work pressure and stress reduce the quality of life. However, leaving a familiar work environment after many years of employment when retiring can force individuals to give up a set of deeply ingrained habits, causing difficulty in adapting and affecting their quality of life. This shows that occupation and work-related stress, while negative, can also provide sources of inspiration and joy in life.

The multivariate analysis results also showed that the lower the family economic status, the lower the quality of life regarding bodily pain, vitality, and mental health. Family economic status plays an important role in daily life, as well as in the treatment and quality of life of patients. When the family does not have a good economic condition, it means that the patient will worry more about treatment costs. This may lead to the patient not being able to afford proper treatment, making the condition worse, and increasing pain sensation due to inadequate treatment, leading to decreased quality of life. On the other hand, the lack of economic conditions directly related to daily life leads to a lower quality of life in terms of mental health for this group of people. Our study's results are consistent with Saleh's study in 2015 in Bangladesh, which showed a difference in the quality of life regarding bodily pain between different income levels of families[22]. The study by Shamshirgaran in New Zealand during 2006-2016 also showed that low income is associated with lower quality of life[23].

Our study also showed that the longer the duration of treatment for T2D, the lower the quality of life in terms of bodily pain, general health, and role-emotional. This is consistent with the reality that prolonged treatment of diabetes can lead to poor treatment adherence, which can impact blood sugar control and thus affect quality of life. One of the most significant factors that affect the quality of life of patients with diabetes mellitus is complications and comorbidities, which have been demonstrated in many studies. Our multivariate analysis results also showed that diabetes patients with complications and comorbidities had lower quality of life regarding physical functioning, role-physical, bodily pain, general health, social functioning, and role-emotional. Diabetes mellitus is a chronic disease, and comorbidities associated with diabetes mellitus can affect patients' physical activity. Moreover, diabetes mellitus can lead to complications in the heart, eyes, brain, kidneys, etc. In practice, all diabetes mellitus complications reduce the patients' quality of life, especially physical health limitations. Whether patients have one or multiple complications, it negatively impacts their quality of life. This result is consistent with Jing's study in 2018, which showed that diabetes mellitus patients with related complications had a lower quality of life[24] .

Our study also showed that the group of patients using injectable insulin had a lower quality of life in terms of physical functioning. Insulin therapy, while having a positive effect on blood glucose control, also has a significant impact on patients' quality of life because of some unintended side effects. This helps explain why the group not treated with injectable insulin had a higher quality of life score than the group treated with insulin. Our findings are consistent with Khunkaew's study in Thailand in 2019, which showed that injecting insulin or combining insulin and oral medication were predictors of a poor quality of life[25]. Similarly, the results of Mohammadi's 2016 study in Iran also showed that the group using injectable insulin had a lower quality of life score than the other group[26]. Additionally, our study also showed that patients with a poorer glycemic control had a lower quality of life in terms of role-physical, bodily pain, social functioning, and role-emotional. It can be argued that glycemic control plays a crucial role in the management of T2D. In practical terms, a poor glycemic control can lead to many negative health outcomes, ultimately affecting the quality of life. These findings are consistent with a study by Svedbo in 2019, in Sweden,

Based on the study's findings, healthcare professionals providing direct care for patients need to pay attention to those with low quality of life scores, older patients, and those with complications or comorbidities. Specifically, they should provide detailed advice on preventing complications and appropriate dietary and exercise regimens, to improve the patients' physical condition. Health education and communication with patients should also be prioritized, to enhance their understanding of T2DM and its complications, enabling early detection and intervention. For patients with moderate to high quality of life scores,

they should maintain appropriate activities and diets, to improve their quality of life[27]. The patients and their families must cooperate with healthcare professionals in treatment and care. Most importantly, patients must try to follow the guidance of healthcare professionals to ensure quality care and improve their quality of life. Future research should apply the quality-of-life questionnaires to a larger sample of T2DM patients across a wider age range, to gain a comprehensive understanding of their quality of life in Vietnam.

Conclusions

Our study conducted in patients with T2D in O Mon district, Can Tho city, highlights that the lowest quality of life score was related to general health. Factors such as age, occupation, family economic status, treatment duration, comorbidities, complications, insulin treatment, and blood glucose index are associated with quality of life. To address this issue, the O Mon district health center should develop a proper process for educating and guiding patients with T2D on their monthly check-ups, especially for those with low quality of life scores. Healthcare professionals who directly examine and treat patients should pay attention to this group of patients with related factors, to ensure that they receive appropriate care. Future research should continue to apply quality of life questionnaires on a larger scale to gain a more comprehensive understanding of the quality of life of patients with T2D in Vietnam.

Author Contributions:

Conceptualization, M.H.L. and N.D.T; methodology, M.H.L. and N.D.T; software, N.A.L.; validation, M.H.L. and N.D.T; formal analysis, M.H.L. and N.D.T; investigation, N.A.L.; resources, T.T.P.; data curation, M.H.L. and N.D.T; writing–original draft preparation, T.T.P. and V.D.T.; writing–review and editing, T.T.P. and V.D.T.; visualization, T.T.P. and V.D.T.; supervision, M.H.K.; project administration, V.D.T. All the authors have read and agreed with the final version of the article. Minh Huu Le and Nguyen Du Tran contributed equally to the study and share the first authorship.

Compliance with Ethics Requirements:

"The authors declare no conflict of interest regarding this article"

"The authors declare that all the procedures and experiments of this study respect the ethical standards in the Helsinki Declaration of 1975, as revised in 2008(5), as well as the national law. Informed consent was obtained from all the patients included in the study"

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