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ORIGINAL RESEARCH

Medication Adherence and The Quality of Life in Patients with Type 2 Diabetes Mellitus

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Abstract

Objective and Aim

Aims: Diabetes mellitus negatively affects the quality of life, work life, interpersonal relationships, social activities and health of patients. The aim of this study is to investigate the relationship between treatment compliance and diabetes-related quality of life in patients with type 2 diabetes.

Material and Methods

This cross-sectional study was conducted at Çukurova University Training Family Health Center between 01 January 2024 and 29 February 2024. Patients who had given informed consent completed the Sociodemographic Data Collection Questionnaire, the Diabetes Specific Quality of Life Scale (DQOL), and the Modified Morisky Scale. Data was analyzed using SPSS (Statistical Package for the Social Sciences) 23.0 package program.

Results

The participants' mean DQOL score was 3.92±0.7 showing a moderate-good quality of life. The participants' mean medication adherence motivation level score was 1.53±0.7 and the mean medication adherence knowledge level score was 1.88±0.7 showing a high level of medication adherence. A weak positive (linear) correlation was found between the medication adherence motivation level scores and DQOL anxiety/worry about diabetes scores (r= 0.168) (p=0.031). A weak positive (linear) correlation was found between low treatment adherence and the anxiety/worry about diabetes (r= 0.180) (p=0.021). It was found that the DQOL scale scores of patients with normal body weight were significantly higher than those of the obese patients (p=0.042). DQOL scale scores were significantly lower in patients with diabetes-related complications compared to those without diabetes-related complications (p=0,002).

Conclusion

As the motivation level for medication adherence increased, anxiety about diabetes decreased. Participant's medication adherence, motivation and knowledge levels were high. Follow-ups of diabetic patients in

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primary care will help to improve their medication adherence and the quality of life.

Keywords: Diabetes mellitus, Quality of life, Medication adherence, Family medicine

1. Introduction

Type 2 diabetes mellitus is the most common type among diabetes classifications and constitutes approximately 90%-95% of all diabetes cases1. The incidence of diabetes is increasing in Türkiye and in the world1. Diabetes mellitus affects the patients' quality of life, work life, interpersonal relationships, social activities and health. Therefore, assessing the quality of life in diabetic patients is important. Medication adherence is affected by many factors including complex treatment methods, comorbidities, side effects and lack of knowledge2. Studies have shown that patients with chronic diseases have lower medication adherence compared to patients with acute diseases3,4.

The aim of this study is to investigate the relationship between treatment compliance and diabetes-related quality of life in patients with type 2 diabetes mellitus.

2. Methods

2.1. Setting

This cross-sectional and descriptive study was conducted at Çukurova University Training Family Health Center between 01 January 2024 and 29 February 2024. Each diabetic adult patient (aged 18-65 years old) completed three questionnaires.

2.2. Study sample

Our study sample consisted of patients with type 2 diabetes mellitus (n=255) between the ages of 18-65 registered at Çukurova University Training Family Health Center. The sample size was calculated using the Openepi program with 95% confidence interval and 5% margin of error giving a minimum of 154 participants. The number of patients recruited in our study was 165.

Exclusion criteria was as follows: Patients younger than 18 years old and older than 65 years old, diabetic patients other than type 2, pregnant, illiterates, patients with cognitive dysfunction or psychiatric disorders.

2.3. Data collection tools

The Sociodemographic Data Collection Questionnaire (developed by the authors) (22 items), Diabetes Specific Quality of Life Scale (DQOL) (45 items) and Modified Morisky Scale (6 items) were used.

Diabetes Quality of Life Measure (DQOL)

This scale was developed by Diabetes Control and Complication Trial research group in 1988. Original DQOL has high internal consistency (Cronbach α = 0,66 - 0,92) and very good reliability (r= 0,78 - 0,92). The scale has 46 items and four domains: Satisfaction (15 questions), impact of treatment (20 questions), social/vocational worry (7 questions) and diabetes-related worry (4 questions). The answers being arranged on a 5-point Likert scale5. The higher your score, the worse the quality of life.

The validity and reliability of the Turkish version of DQOL was performed by Yıldırım et al in 2007. The number of items in domains are 15, 19, 7, 4 respectively (one question less in total compared to the original questionnaire). In the Turkish version scores were reversed for easier interpretation. The higher your score, the better the quality of life. Turkish version of DQOL has Cronbach α 0,89 and domains have Cronbach α 0.80 - 0.946.

Modified Morisky Medication Adherence Scale

The original scale was developed by Morisky et al in 1980s7. Two questions were added and modified scale was formed. The validity and reliability of Turkish version of this scale was performed by Vural et al in 2012. Cronbach α coefficient is 0,710 and 0,726.

2.4. Statistical analysis

SPSS (Statistical Package for the Social Sciences) 23.0 package program was used for statistical analysis of the data. The data included in the study is categorized into two groups: categorical and continuous measurements. Categorical Measurements: Summarized in terms of counts and percentages. Continuous Measurements: Summarized using mean and standard deviation. Where necessary, median, minimum, and maximum values are also reported. Normal Distribution Analysis: To determine whether the parameters show a normal distribution, the skewness and kurtosis values of the scale scores were examined. Statistical Tests: For parameters that show normal distribution, the Independent Student's t-test was used for binary group analyses. The One-Way ANOVA test was applied for analyses involving more than two groups. To identify the source of differences among groups with more than two variables, the Post Hoc Bonferroni Test was employed. Relationship Analysis: To determine the relationship between scales, the Pearson Correlation Test was utilized. Regression Analysis: A multiple linear regression model was used to identify the factors affecting the DQOL scale. The statistical significance level was accepted as $p<0.05$.

2.5. Approval

The study was approved by the Ethics Committee of Çukurova University Faculty of Medicine on 08 December 2023 with number ÇÜTF GOKAEK 2023/139.

3. Results

3.1. Sociodemographic and diabetic characteristics of participants are presented in Table 1.

3.2. Scale scores of the study population

The participants' mean DQOL score was 3.92±0.7 showing a moderate-good quality of life. The participants' mean medication adherence motivation level score was 1.53±0.7 and the mean medication adherence knowledge level score was 1.88±0.7 showing a high level of medication adherence (Table 2). A weak positive (linear) correlation was found between the medication adherence motivation level and the anxiety/worry about diabetes (r= 0.168) (p=0.031). A weak positive (linear) correlation was found between low treatment adherence and the anxiety/worry about diabetes (r= 0.180) (p=0.021)

It was found that the DQOL scale scores of patients with normal body weight were significantly higher than those of the obese patients (p=0.042). DQOL scale scores were significantly lower in patients with diabetes-related complications compared to those without diabetes-related complications (p=0,002). The mean DQOL scale score was 3.92±0.5 In our study, the mean score for motivation level for medication adherence in the Modified Morisky Scale was 1.53±0.7 and the mean score for knowledge level for medication adherence was 1.88±0.7. There was a weak positive linear correlation between the DQOL anxiety/worry about diabetes disease scale score and Modified Morisky Scale motivation level scale score (r=0.168) (p=0.031). A weak positive (linear) correlation was found between low treatment adherence and anxiety/worry about diabetes scale scores about diabetes(r=0,180) (p=0,021).

Of the participants, 59 (35,8%) had low motivation whereas 106 (64,2%) had high motivation. Of the participants, 35 (21,2%) had low level of knowledge whereas 130 (78,8%) had high level of knowledge.

There was a significant positive (linear) weak (r=0,207) difference between participants' age and social/vocational worry scores (p=0,008).

There was a significant positive (linear) weak (r=0,219) difference between participants' waist circumferences and medication adherence motivation scores (p=0,005).

There was a significant difference between

Table 1. Sociodemographic and diabetic findings of the participants

		Number (n)	**Percentage (%)**
Gender	Female	92	55.8
	Male	73	44.2
Body Mass Index	Normal weight	24	14.5
	Overweight	112	67.9
	Obese	29	17.6
Marital status	Married	148	89.7
	Single	10	6.1
	Divorced	2	1.2
	Widow	5	3
Mean monthly income	Below minimum wage	68	41.2
	Minimum wage	51	30.9
	Above minimum wage	46	27.9
Educational status	Basic reading-writing	12	7.3
	Primary school graduate	57	34.5
	Secondary school graduate	41	24.8
	High school graduate	37	22.4
	University graduate	14	8.5
	MSc, PhD	4	2.4
Family type	Living alone	14	8.5
	Nuclear family	141	85.5
	Large family	10	6
Smoking habit	Smoker	48	29
	Non-smoker	102	61.8
	Occasional smoker	7	4.2
	Ex-smoker	8	4.8
		Mean ± SD	Med (Min-Max)
	Age (years)	54.2±7.5	55 (27-65)
	Height	166.3±8.6	165 (140-185)
	Weight	76.9±10.0	77 (55-105)
	Waist circumference	101.0±8.9	101 (78-126)
	Number of cigarettes smoked a day	17.9±7.9	20 (1-35)
Duration of diabetes	0-5 years	56	33.9
	6-10 years	49	29.7
	More than 10 years	60	36.4
Comorbidity	Yes	106	64.2
	No	59	35.8
Type of comorbidity	Hypertension	54	50.9
	Hypercholesterolemia	40	37.7
	Asthma-COPD	16	15.1
	Thyroid dysfunction	5	4.7
	Cardiac diseases	4	3.8
	Other	20	18.9
The most commonly used treatments for diabetes	Oral antidiabetic	159	96.4
	Diet	112	67.9
	Exercise	98	59.4
	Insulin	22	13.3
	Herbal	9	5.5
Physical activity for diabetes	Regular	33	20
	Occasional	65	39.4
	Never	67	40.6
Diet for diabetes	Regular	49	29.7
	Occasional	67	40.6
	Never	49	29.7

Diabetic complications	Yes	36	21.8
	No	92	55.8
	No information	37	22.4
Type of diabetic complications	Diabetic neuropathy	25	69.4
	Diabetic retinopathy	8	22.2
	Cardiovascular disease	4	11.1
	Diabetic nephropathy	3	8.3
	Diabetic foot	1	2.8
Frequency of visiting a doctor for diabetes	At least every three months	75	45.5
	At least every six months	37	22.4
	At least once a year	31	18.8
	Not regularly	22	13.3
Preferred health institution for diabetes follow-ups	Primary care	96	58.2
	Second care	69	41.8
	Tertiary care	67	40.6
	Private hospital	19	11.5
	Private practice	4	2.4
Presence of a glucometer at home	Yes	98	59.4
	No	67	40.6
Measuring blood sugar at home	Regularly	48	29.1
	Occasionally	52	31.5
	Never	65	39.4

SD: Standard Deviation, PhD: Philosophiae Doctor, COPD: Chronic obstructive pulmonary disease

body mass index groups and social/vocational worry scores and DQOL scores (p=0,045 and p=0,046, respectively). Post Hoc Bonferroni test was performed and it was found that participants with normal BMI have higher scores of worry and DQOL compared to obese participants (p=0,049 and p=0,042, respectively).

The social/vocational worry scores and DQOL scores of the married participants were significantly higher compared to those of single participants (p<0,001 and p=0,013, respectively).

There was significant difference between the educational status and treatment satisfaction, worry about diabetes, social/vocational worry scores (p=0,029; p=0,003; p=0,002, respectively).

There was a significant difference between the family type and treatment satisfaction, social/vocational worry and DQOL scores (p=0,014; p<0,001; p=0,002, respectively).

Regular physical exercise was significantly related to treatment satisfaction and medication adherence knowledge level scores (p<0,001; p=0,021, respectively).

Regular diet for diabetes was significantly related to treatment satisfaction and medication adherence knowledge level scores (p=0,001; p=0,027, respectively).

Diabetic complications were significantly related to psychological impact of the treatment, worry about diabetes and DQOL scores (p<0,001; p<0,001; p=0,001, respectively).

The participants having glucometer at their home and measuring their blood glucose level had lower scores in psychological impact of treatment, worry about diabetes and DQOL scores (p<0,001; p=0,016; p=0,004, respectively) and higher scores in medication adherence motivation score (p=0,001) compared to the ones without glucometer at home and not measuring their glucose level.

There was a significant positive (linear) weak (r=0,168) difference between medication adherence motivation score and

Table 2. Scale scores of the study population

	Number of items	Mean	SD	Med	Min	Max
Satisfaction with treatment	15	3.28	0.7	3.27	1.27	4.93
Psychological impact of treatment	19	3.81	0.5	3.89	2.37	4.68
Anxiety/worry about diabetes	4	3.80	0.8	4	1.5	5.0
Social and vocational worry	7	4.78	0.4	5.0	2.71	5.0
DQOL	45	3.92	0.5	3.93	2.39	4.82
Medication adherence motivation level	3	1.53	0.7	2	0	3.0
Medication adherence knowledge level	3	1.88	0.7	2	0	3.0

SD: Standard deviation, Med: Median, Min: Minimum, Max: Maximum, DQOL: Diabetes Specific Quality of Life Scale

worry about diabetes score (p=0,031) (Table3).

Table 3. DQOL and Modified Morisky Scale scores

	Motivation level		Knowledge level	
	r	p	r	p
Treatment satisfaction	0,068	0,385	-0,082	0,297
Psychological impacts of treatment	0,001	0,990	-0,120	0,125
Worry about diabetes	0,168*	0,031	0,051	0,518
Social and vocational worry	-0,052	0,509	0,022	0,779
DQOL	0,088	0,263	-0,034	0,669
Medication adherence motivation level				
Medication adherence knowledge level	0,139	0,074		

**p<0,05, Pearson korelasyon*

Table 4. Correlation between scale scores

	High Motivation High Knowledge (High Treatment Compliance)		Low motivation Low Knowledge (Low Treatment Compliance)	
	r	p	r	p
Satisfaction with treatment	-0,015	0,846	0,081	0,302
Psychological effects of treatment	-0,029	0,709	0,006	0,943
Anxiety/worry about diabetes	0,029	0,709	0,180*	0,021
Social and occupational anxiety	-0,024	0,763	-0,092	0,239
DQOL	0,004	0,957	0,098	0,210

*p<0,05, Pearson korelasyon

There was significant positive (linear) weak (r=0,180) difference between low adherence to medication and worry about diabetes score (p=0,021) (Table 4).

4. Discussion

In our study, a weak positive linear relationship (r=0.207) was observed between participants' age and social/vocational worry scale scores (p=0.008). In contrast to our findings, Rubin and Peyrot8 and Dörtbudak et al9 did not identify a significant association between age and quality of life. This discrepancy may be related to patients' acceptance of and adaptation to the disease, treatment processes, and self-management skills.

No significant difference was found between participants' income status and scale scores. Similarly, Aloudah et al reported no significant association between income level

and medication adherence.10 However, the literature generally indicates a significant relationship between low income level, reduced quality of life, and poor medication adherence.8,11,12 This may be explained by the fact that low income can limit access to medications and basic needs, thereby negatively affecting quality of life and adherence to treatment.

A significant relationship was observed between educational status and both satisfaction with treatment and social/vocational worry scale scores. Participants with higher educational levels reported greater satisfaction with treatment, possibly due to better knowledge of diabetes and enhanced self-management skills.

Interestingly, social/vocational worry scores were higher among participants with lower educational levels compared to those with higher educational attainment. This may be related to individuals with higher education being more sensitive to vocational outcomes. Wandell reported that educational level has a limited effect on quality of life.13 In contrast, Erkek et al found that the quality of life in patients with diabetes improved as educational level increased.14 These discrepancies may be attributed to differences in sociodemographic characteristics and geographical settings across studies.

Rubin and Peyrot8 demonstrated that diabetes-related complications negatively affect quality of life. The development of complications in patients with diabetes mellitus may lead to reduced quality of life due to increased medication requirements, physical symptoms, medical examinations, and lifestyle restrictions. Our findings are consistent with the existing literature.

In our study, a weak positive linear correlation was identified between medication adherence motivation scale scores and anxiety/worry about diabetes scale scores (r= 0.168) (p=0.031). Additionally, a weak positive linear correlation was observed between low treatment adherence and anxiety/worry about diabetes scale scores (r= 0.180) (p=0.021). Honish et al. reported that quality of life improved as treatment adherence increased.15 Similarly, Chew et al. found a significant relationship between medication adherence and quality of life in patients with type 2 diabetes mellitus, with poorer adherence observed among participants with lower quality of life.11 The discrepancy between our findings and those in the literature may be attributed to patients' insufficient awareness of the consequences of treatment nonadherence, which may reduce anxiety levels. To our knowledge, no previous study has evaluated the relationship between quality of life and medication adherence in patients with type 2 diabetes mellitus using both the DQOL scale and the six-item Modified Morisky Scale.

Strengths

This study is one of the few that utilized both the DQOL and the Modified Morisky Scale. As the prevalence of diabetes mellitus continues to increase, the role of family physicians and primary care services becomes increasingly important.

Limitations

The data were collected from a single Family Health Center; therefore, the findings cannot be generalized. Additionally, as the questionnaires were self-administered, there is a potential risk of subjectivity.

Conflict of interest

The authors declare no conflict of interest.

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