

Comprehensive Analysis of Health Related Quality of Life in Patients with Diabetes: A Study From Konya Turkey

Konya'daki Diyabetik Hastaların Sağlıkla İlişkili Yaşam Kalitesinin Kapsamlı Analizi

Sait Gönen, Kağan Güngör, Ali Savaş Çilli*, Ümit Kamlı**, Zehra Akpınar***, Gürcan Kısakol, Oğuz Dikbaş, Süleyman Türk****, Taha Hidayetoğlu*****, Aysun Akça***, Afşin Celal Kılınç**, Ahmet Kaya

Selçuk University Meram Medical Faculty, Endocrinology and Metabolism, Konya, Turkey

*Selçuk University Meram Medical Faculty, Psychiatry, Konya, Turkey

**Selçuk University Meram Medical Faculty, Ophthalmology, Konya, Turkey

***Selçuk University Meram Medical Faculty, Neurology, Konya, Turkey

****Selçuk University Meram Medical Faculty, Nephrology, Konya, Turkey

*****Selçuk University Meram Medical Faculty, Internal Medicine, Konya, Turkey

Abstract

Objective: The effects of diabetes on Health Related Quality of Life (HRQOL) have been investigated with different designed studies which aimed to clarify this subject from different perspectives and some of the results of these studies from different countries were controversial. We have designed our study to investigate the HRQOL in patients with diabetes about different perspectives with more comprehensive approach. This study is the first one from Turkey which has aimed to investigate the effects of diabetic complications, metabolic control and obesity on HRQOL with SF-36 questionnaire.

Material and Methods: We enrolled 193 women, 151 men, total 344 patients with diabetes mellitus admitted to our outpatient clinics in to the study. Ages, gender, diabetes duration (DD), salary, anthropometric measurements including height, weight, waist and hip circumferences and Body Mass Index (BMI) have been recorded. Diabetic complications including retinopathy (RP), nephropathy (NEPH), neuropathy (NEURO), gastroparesis (GASTRO), cardiac disease (CARD) and diabetic foot complications (EXTR) have been rated on a scale.

Results: Diabetic complications, HbA1c and BMI have been determined as independent variables that affect the HRQOL. The effect of these variables on HRQOL have been investigated with stepwise multiple regression analysis. In this comprehensive research, less education, lower income, older age, being female, metabolic control, non adherence to diet, medication and exercise, longer diabetes duration, obesity, and numbers and severity complications have been related with lower HRQOL.

Conclusion: According to study, HRQOL has been related with many various parameters. HRQOL in patients with diabetes can be improved by certain medical interventions and by educational and counseling interventions design with multidimensional perspective. *Turk Jem 2007; 11: 81-8*

Key words: Quality of life, diabetes mellitus, diabetic complications

Özet

Amaç: Diyabetin (Sağlıkla ilgili yaşam kalitesi) yaşam kalitesi üzerine etkisi bir çok ülkede farklı bakış açıları ve değişik metodlar kullanarak yapılmış çalışmalar ile araştırılmış ve birbirinden farklı sonuçlar elde edilmiştir. Çalışmamızda diyabetin yaşam kalitesi üzerine etkisini farklı açılardan bakarak daha ayrıntılı ve geniş kapsamlı bir şekilde incelemeyi amaçladık. Bu çalışma SF-36 anketi kullanılarak diyabetik komplikasyonların, metabolik kontrolün ve obezitenin yaşam kalitesi üzerine etkisini incelemeyi amaçlayan Türkiye' de yapılmış ilk çalışmalarındandır.

Gereç ve Yöntemler: Çalışmamız polikliniklerimize başvuran 193'ü kadın 151'i erkek toplam 344 diyabetik hastada yapıldı. Yaş, cinsiyet, diyabet süresi, gelir düzeyi ile boy, kilo, bel ve kalça çevresi ve vücut kitle indeksi (BMI) gibi antropometrik parametreler kaydedildi. Diyabetik komplikasyonlar olan Retinopati (RP), Nefropati (NEPH), Nöropati (NEURO), Gastroparezi (GASTRO), Kalp-damar hastalığı (CARD) ve diyabetik ayak komplikasyonları (EXTR) bir skala ile derecelendirildi.

Bulgular: Diyabetik komplikasyonlar, HbA1c ve BMI'nin yaşam kalitesini belirleyen bağımsız değişkenler olduğu saptandı. Değişkenlerin yaşam kalitesine etkisi stepwise multiple regresyon analizi ile incelendi. Bu kapsamlı araştırmanın sonucunda düşük eğitim düzeyi ve gelir, ileri yaş, kadın cinsiyeti, metabolik kontrol, diyet ve ilaç uyumu, uzun diyabet süresi, obezite ile komplikasyonların sayısının ve derecelerinin artması düşük yaşam kalitesi skoru ile ilişkili bulundu.

Sonuç: Sonuç olarak yaşam kalitesi pek çok farklı parametreden etkilenmektedir. Diyabetik hastalarda yaşam kalitesi ancak çok boyutlu bakış açılarından konuya eğilen, eğitim ve danışmanlık hizmetlerini içinde barındıran farklı medikal yöntemleri içeren yeni bakış açıları ile iyileştirilebilecektir. *Turk Jem 2007; 11: 81-8*

Anahtar kelimeler: Yaşam kalitesi, diabetes mellitus, diyabetik komplikasyonlar

Introduction

As a common chronic metabolic disease, diabetes mellitus affects patient's general health, well being and social life in various ways. Suffering from acute and chronic complications of diabetes, symptoms of diabetes, dietary restrictions, medications and co-morbid diseases may lead to deterioration patient's health related quality of life (HRQOL) (1, 2).

HRQOL "refers to the physical, psychological and social domains of health that are influenced by a person's experiences, beliefs, expectations and perceptions" (2, 8). HRQOL can be evaluated either through generic or disease-specific questionnaires (3) (9). General HRQOL questionnaires are useful scales for measuring the specific impact of the disease itself on patient well-being. These scales measure patient's physical, emotional and mental functions social concepts and health perceptions, general life satisfactions, activity or role functioning, sleep and pain (1, 2).

In this comprehensive study we have investigated our patients' quality of life, associated factors and relationships between diabetic complications and these different parameters with SF-36 questionnaire and results have been analyzed with multidimensional approach.

Materials and Methods

A total 344 outpatients (193 women, 151 men) with diabetes mellitus who admitted to the Outpatient Clinics of Turkish Diabetes Association and Selcuk University Meram Medical Faculty Division

of Endocrinology and Metabolism, were enrolled to the study. These patients were included over a 6 month period from June 2003 through January 2004. Each patient who consented to participate was examined clinically by one of the researchers. Age, gender, types of diabetes, diabetes duration, medications, insulin use, education, salary, marital status, exercise, diet and oral medication adherence were recorded in a standardized form. Height, weight, waist and hip circumferences were measured and recorded.

SF-36 is one of the most widely used generic health related quality of life questionnaire which consists of 36 questions that provides a profile of eight health domains:

1. Physical function (PF);
2. Role function as limited by physical problems (RP);
3. Bodily pain (BP);
4. General health perceptions (GH);
5. Vitality (VT);
6. Social function (SF);
7. Role function as limited by emotional problems (RE); and
8. Mental health (MH).

Patients filled out the SF 36 questionnaire in the waiting room or at their home by themselves.

Complications associated with diabetes mellitus were also recorded by a standardized protocol which has been used before by Brown et al (4, 11). Diabetic complications including retinopathy, nephropathy, neuropathy, gastroparesis, cardiac disease and limb abnormalities have been rated on a scale of 0 to 3, with the exception of retinopathy. Retinopathy has been rated on a scale of 0 to 4. The rating scale is shown in table 1. (Rating scale adapted from Brown et al).

Table 1. Rating scale for complications associated with diabetes mellitus

Complication	Rating	Definition
Retinopathy	0	No diabetic retinopathy
	1	Retinopathy present – vision of 20/20 –20/25 in the better seeing eye
	2	Retinopathy present –vision of 20/30 -20/50 in the better seeing eye
	3	Retinopathy present –vision of 20/60-20/100 in the better seeing eye
	4	Retinopathy present- vision of 20/200 or less in the better seeing eye
Nephropathy	0	No history of nephropathy
	1	History of proteinuria or mild renal dysfunction
	2	History of renal dysfunction requiring medication
	3	History of renal dialysis or transplantation
Neuropathy	0	No neuropathy
	1	Mild paresthesias and/or numbness
	2	Severe paresthesias and/or numbness
	3	Severe paresthesias and/or numbness with pain
Gastroparesis	0	No gastroparesis
	1	History of mild gastroparesis
	2	History of gastroparesis requiring medication
	3	History of gastroparesis with frequent severe vomiting
Cardiac disease	0	No history of cardiac disease
	1	History of coronary artery bypass surgery
	2	History of myocardial infarction
	3	Active congestive heart failure
Extremities	0	No abnormalities
	1	History of foot ulcers
	2	History of osteomyelitis and/or gangrene
	3	Status post-amputation

Statistical Analysis

The SF-36 questionnaire's results, demographic, clinic and laboratory data and anthropometric measurements have been obtained with same standard form and these data have been analyzed with SPSS 11.0 for Windows computer program. The difference of SF 36 scores according to sex, exercise and diet adherence, types of diabetes, insulin usage and marital status have been compared with student's test. The correlations between SF 36 scores and salary, diabetes duration, age, BMI, plasma glucose, HbA1C and CRP levels and the severity of diabetic complications have been analyzed with Pearson's test. To determine the independent effects of the parameters on SF 36 scores, the severity of diabetic complications, plasma HbA1C level and BMI have been entered multiple linear regression analysis.

Results

We studied on 193 female (56%), 151 male (44%) total 344 patients. There were 13 (3%) type 1 and 331 (97%) type 2 diabetic patients in this study. A total of 115 (33%) patients were treated for diabetes with either diet or oral antidiabetics, while 229 (67 %) patients were treated with insulin.

Of the 344 patients; 62 (18%) have only literate but no schooling, 205 (60 %) patients have 5 years, 20 (6 %) patients 8 years, 27 (8%) patients 11 years and 30 (8%) patients 15 years of education.

Age, diabetes duration (DD), anthropometric measurements like BMI and Waist to Hip ratio (WHR) and HbA1C levels according to sex were presented in table 2. There was not any statistical significant difference between sexes on their age, WHR, HbA1C and DD except higher BMI among female patients ($p < 0.05$)

Score distributions of diabetic complications according to Brown scale have been presented in the Table 3.

The difference on patients quality of life scores according their sex, exercise and diet adherence, types of diabetes, insulin usage, marital status and education level have been presented in Table 4. The correlations between salary, diabetes duration, age, BMI, plasma glucose, HbA1C, CRP and severity of diabetic complica-

tions and SF-36 scores have been presented in Table 5 and 6.

Multiple linear regression analysis have shown us models for every domains of the SF-36 (Table 7).

In our study, we have shown the effects of diabetic complications, good metabolic control and obesity, sex, age, diabetes duration, education, BMI, WHR, metabolic control (HbA1C), salary, diabetes type, diet and exercise adherence, marital status and insulin therapy on quality of life.

Discussion

According to TURDEP (Turkish Diabetes Epidemiology Study) study, prevalence of diabetes mellitus and impaired glucose tolerance in Turkey were 7.2 % and 15.9%, respectively (5, 12). According to the same study, the highest prevalence of obesity was found in the central Anatolia and Konya the one of the most populated cities of this area. In our community based screening study incidence of diabetes and obesity were 9.5% and 29%, respectively (6, 14).

HRQOL and Diabetes Duration

On one hand most of the studies found that increased duration of diabetes have been associated with decreased HRQOL, in both types of diabetes (7-9, 16,17,18). On the other hand, in the literature, there are also contrary results about the association between duration of diabetes and HRQOL. We have found that there has been an association between diabetes duration and HRQOL. The longer duration of diabetes is associated with the worse HRQOL according to our result.

HRQOL and Sex, Education and Obesity

Researchers have reported that HRQOL is better among diabetic men than among diabetic women (10, 15). This difference has also been noticed in general healthy population (11,12, 22-26). Rubin et al reported that men were more satisfied with their diabetes treatment regimen, and missed less work and fewer leisure activities as a result of diabetes, than women (10, 15). In the literature it has also been reported that men with diabetes report less disease impact with more treatment satisfaction than women (13-15, 19, 27, 28). We have found that men had better HRQOL scores nearly for all SF-36 domains compared to women. In Dutch study (16, 21), women had significantly lower HRQOL scores than men and this difference was explained with gender difference of obesity. In our study we have found that women are more obese than men as found in the Dutch study and our results support this explanation. Our results have also been showed that men have higher education level than women and there is a positive correlation between education level and QOL. This may be another explanation of higher HRQOL scores in men.

It has been investigated whether education has had an effect on

Table 2. Patient characteristics according to sex

	Women	Men	Total
Age	54.82±11.29	58.91±10.53	56.53± 11.13
BMI *	31.68± 4.90	28.76± 3.87	30.39± 4.69
WHR	0.9±0.1	0.9± 0.1	0.9± 0.1
HbA1C	8.64±2.61	8.18 ±2.46	8.44 ±2.55
DD	8.78±6.08	9.11±6.00	8.93±6.47

BMI- Body Mass Index, WHR- Waist to Hip Ratio, DD- Diabetes Duration
* $p < 0.05$

Table 3. Score distribution of diabetic complications n=344

Score	DRP	NEPH	EXTR	GASTRO	NÖROP	CARD
0	248	254	314	289	132	317
1	58	79	27	37	140	8
2	23	9	2	18	41	13
3	13	2	1	0	31	6
4	2	-	-	-	-	-

Table 4. The effect of the some parameters on HRQOL domains

	Sex		Exercise		Diet		DM		Insulin		Marital	
	Female	Male	Adherent	Nonadherent	Adherent	Nonadherent	Type 1	Type 2	User	Non-user	Married	Single
PF	54.8±27.2	66.1±22.6	69.2±21.7	54.7±26.2	63.3±25.4	56.2±25.9	70.4±26.1	58.7±25.7	55.6±28	60.8±24.7	60.3±25.6	53.1±22.5
		p<0.001		p<0.001		p=0.027		NS		NS		NS
RP	48.5±41.7	56.4±40.1	51.9±43.2	52.0±39.9	51.3±42.1	52.8±40.0	22.9±41.9	52.3±40.7	39.1±40.7	57.0±40.4	54.8±40.4	42.2±44.6
		NS		NS		NS		p=0.015		p<0.001		NS
BP	48.6±20.8	63.4±24.4	57.6±23.1	53.8±23.7	56.6±23.7	53.7±23.4	41.1±25.1	55.6±23.6	49.2±24.1	57.8±23.4	55.8±23.5	49.1±19.5
		p<0.001		NS		NS		p=0.031		p=0.003		NS
GH	39.4±21.4	51.0±22.4	47.9±23.4	43.3±22.2	46.9±22.2	42.8±22.7	26.8±12.7	45.1±22.3	35.1±19.2	48.9±22.7	45.2±22.5	38.0±20.6
		p<0.001		NS		NS		p<0.001		p<0.001		NS
VT	45.8±18.7	59.3±20.7	56.4±19.0	50.0±20.9	53.8±22.0	50.3±19.5	47.3±20.8	51.8±20.7	46.1±19.2	54.4±21.0	52.4±20.8	46.2±14.8
		p<0.001		p=0.016		NS		NS		p<0.001		p=0.036
SF	64.9±24.7	68.4±22.6	69.6±18.5	65.9±25.0	68.0±22.2	66.3±24.2	57.7±18.8	66.5±23.9	58.9±23.5	69.8±23.1	67.6±23.1	64.4±24.4
		NS		NS		NS		NS		p<0.001		NS
RE	44.8±39.9	50.6±39.4	50.8±38.6	45.6±39.5	44.4±39.4	49.3±39.2	22.2±35.8	47.7±39.5	39.5±37.4	50.0±40.5	48.9±39.0	41.7±42.3
		NS		NS		NS		p=0.029		p=0.027		NS
MH	52.6±19.7	61.7±19.0	59.6±18.2	55.3±20.2	57.6±19.2	55.8±20.0	47.7±12.3	56.7±20.1	52.0±20.2	58.2±19.5	57.4±19.6	50.6±17.9
		p<0.001		NS		NS		p=0.024		p=0.010		NS

NS- Nonsignificant

Table 5. HRQOL and correlated parameters

		Salary	DD	Age	BMI	Glucose	HbA1c	CRP
PF	p	0.003	0.000	0.000	0.000	0.034	0.001	0.001
	r	0.185	-0.257	-0.390	-0.265	-0.121	-0.183	-0.256
RP	p	NS	0.000	NS	0.041	NS	0.007	NS
	r	0.121	-0.203	-0.093	-0.120	-0.091	-0.154	-0.109
BP	p	0.000	NS	NS	0.003	0.001	0.016	0.027
	r	0.249	-0.089	-0.064	-0.170	-0.187	-0.134	-0.162
VT	p	0.007	0.000	NS	NS	0.025	0.001	NS
	r	0.163	-0.211	-0.093	-0.095	-0.123	0.180	-0.077
SF	p	NS	NS	NS	NS	0.001	0.013	NS
	r	0.070	-0.093	-0.058	-0.033	-0.175	-0.139	-0.119
RE	p	0.044	NS	NS	NS	NS	0.044	NS
	r	0.124	-0.078	-0.031	-0.034	-0.098	-0.114	0.009
MH	p	NS	NS	NS	NS	0.007	0.016	0.009
	r	0.036	-0.108	0.019	-0.037	-0.150	-0.135	-0.155
GH	p	NS	0.000	NS	NS	0.002	0.000	NS
	r	0.049	-0.237	0.031	-0.062	-0.175	-0.201	-0.137

NS- Nonsignificant

HRQOL of diabetic patients. Brown (4, 11) and Redekop (16, 21) could not show a difference between the education and quality of life in type 2 diabetic patients but Rubin(10) (15), Glasgow (8, 17) Klein (9, 18) and Gulliford (17, 29) et al. have demonstrated that higher income and educational level also scored higher on all HRQOL subscales in patients with diabetes. In our study, higher education level had a positive effect on HRQOL of patients.

HRQOL and Age

Age has been another parameter which has an effect on diabetic patients' quality of life. Brown (4, 11) and Rubin et al. (10, 15) from USA, Hanninen et al. (1, 2) from Finland have reported that age has no effect on diabetic patient's quality of life but Gulliford from Trinidad and Tobago (17, 29), Redekop et al. (16, 21) from Netherlands, Klein (9, 18) and Glasgow (8, 17) et al from USA have

Table 6. Diabetic complications and correlations

		DRP	D NEPH	D NEUR	GASTRO	CARD	EXTR
PF	p	NS	0.006	0.003	NS	NS	0.025
	r	-0.102	-0.162	-0.176	-0.116	-0.088	-0.140
RP	p	NS	0.039	0.030	NS	NS	NS
	r	-0.111	-0.119	-0.126	-0.023	-0.024	-0.087
BP	p	NS	0.034	0.000	NS	NS	NS
	r	-0.068	-0.119	-0.216	-0.109	-0.054	-0.049
VT	p	0.030	0.024	0.001	NS	NS	0.008
	r	-0.125	-0.127	-0.185	-0.051	-0.072	-0.159
SF	p	NS	0.005	NS	NS	NS	NS
	r	-0.035	-0.15	-0.070	0.019	-0.058	-0.091
RE	p	NS	NS	NS	NS	NS	NS
	r	-0.087	-0.033	-0.112	0.036	-0.015	-0.072
MH	p	NS	NS	NS	0.018	NS	0.001
	r	-0.053	-0.057	-0.071	-0.146	-0.085	-0.205
GH	p	0.000	0.048	0.000	NS	NS	0.009
	r	-0.210	-0.115	-0.218	-0.092	-0.086	-0.162

NS- Nonsignificant

Table 7. Regression analysis models for the domains of the SF-36

DOMAIN OF THE SF-36	MODEL	R	R square
PHYSICAL FUNCTION	HbA1C	0.281	0.79
	HbA1C + BMI	0.357	0.128
	HbA1C + BMI + NEPH	0.395	0.156
	HbA1C + BMI + NEPH + EXTR	0.421	0.177
ROLE FUNCTION	NEURO	0.276	0.76
	NEURO + HbA1C	0.320	0.102
BODILY PAIN	BMI	0.293	0.86
	BMI + NEURO	0.411	0.169
GENERAL HEALTH	NEURO	0.288	0.83
	NEURO + EXTR	0.336	0.113
	NEURO + EXTR + RP	0.371	0.137
VITALITY	NEURO	0.277	0.77
	NEURO + BMI	0.340	0.116
	NEURO + BMI + EXTR	0.370	0.137
SOCIAL FUNCTION	EXTR	0.208	0.43
	EXTR + NEPH	0.277	0.77
MENTAL HEALTH	EXTR	0.287	0.82

reported that older age has had a negative effect on patients quality of life. Glasgow (8, 17) et al found that, younger patients had significantly higher physical and social functioning scores and Klein (9, 18) et al found that older patients had lower levels of physical functioning and physical role functioning scores. In our study we found that older age had a negative correlation with only PF domain of SF-36 questionnaire. This result is similar with findings of Glasgow and Klein et al. and suggests that older patients generally attributed their health problems to aging and therefore have been able to cope with their living conditions better. Redekop et al also suggested another theory about age that the prospect of future disease progression is especially distressing for younger patients (16, 21).

HRQOL and Socioeconomic Status

In general population, a strong association has been demonstrated between socioeconomic status (measured by income and educational level) and quality of life (18-20, 30-32). In our study economic status has been associated with PF, BP, and VT and RE domains of the SF-36. Mean income in Turkey is 3000-4000 US dollars per person for year. Income in USA and European countries is nearly ten times higher than our country. According to education level we are less educated than these countries too but the effect of income and education level on HRQOL in our study is similar with these countries results.

HRQOL and Diet, Exercise and Medication Adherence

Cramer begins to his systemic review about the medication adherence of diabetic patients and emphasizes that diabetes is a complex disorder that requires constant attention to diet, exercise, glucose monitoring and medication to achieve good glycemic control (21, 33). Although their review has confirmed that, many patients with diabetes have taken less than their prescribed medication including oral hypoglycemic agent (OHA) and insulin. In chronic disorders adherence to diet exercise and medications are real problems. Age, complexity of treatment duration of disease, depression and psychosocial issues have been the determiner of the adherence to treatment in patients with diabetes (22, 34). According to our questionnaire based data taken from diabetic patients; we have found that diet and exercise adherence have had positive effect on physical functioning domains of the HRQOL in patients with diabetes. In our opinion, medical interventions, patient-clinician relationships, education and counseling will improve adherence in patients with diabetes.

HRQOL and Marital Status

In the literature it has been shown that support from others can facilitate recovery from physical illness and enhance the ability to cope with and adapt to the consequences of chronic illnesses (23, 35). Social support studies have focused on family support. The study which was conducted by Trief et al had shown that, quality of marriage is associated with adaptation to diabetes and other aspects of HRQOL for insulin treated adults with diabetes (24, 36). Most of the patients were married in our study and we did not investigate the quality of marriage but in our analysis we did not find any effects of status of marriage on HRQOL in patients with diabetes.

HRQOL and High Sensitive CRP

In the literature we have not found any study with the effects of sensitive CRP on HRQOL in patients with diabetes. In our study

high sensitive CRP has inversely been associated with PF, BP and MH domains of the SF-36. It has been shown in literature that there has been an association between levels of high sensitive CRP and atherosclerosis (25, 37). The other important interesting point of our study has been high sensitive CRP correlated with only cardiac complication scores.

Quality of Life Diabetic Neuropathy

Insidious symptoms of neuropathy are generally found unimportant by the patient and the clinicians but in previous studies, neuropathic symptoms were the most strongly associated with physical score of HRQOL (17, 29). In our analysis although we have not found association between diabetic neuropathy and PF domains of the SF-36 HRQOL questionnaire but we found strong associations between diabetic neuropathy and RP, BP, GH and VT domains of the SF-36. With regard to our regression analysis results, neuropathy has been the most important independent effective parameter in RP, GH and VT domains. Retrospective and prospective studies have suggested a relationship between hyperglycemia and the development and severity of diabetic neuropathy (26, 40). The highest prevalence has been found in patient with poorest diabetes control. The better metabolic control is associated with lower incidence and lesser symptoms of diabetic neuropathy so the preventive measures or therapies against to neuropathy also result in amelioration of patients QOL.

Quality of Life and Metabolic Control

It has been shown that better metabolic control has been associated with a better HRQOL in adolescent type 1 diabetic patients (27, 41). In type 2 diabetic patients, the effect of good metabolic control and self-regulation of diabetes with the method of self-monitoring of blood glucose (SMBG) on HRQOL has been assessed in literature. The results are more complex in type 2 diabetic patients. If the patients had not been educated for ability to self manage insulin doses, there would have been no association between SMBG and HbA1C in insulin treated subjects with type 2 diabetes (28,29, 42, 43). Although, in literature, it is shown that, under routine clinical practice conditions, a correlation between self monitoring and better metabolic control is present in insulin treated type 2 diabetic patients (30, 44). Among type 2 diabetic patients who have not been treated with insulin, a higher frequency of SMBG have been associated with higher HbA1C levels. The patients with poor metabolic control have had a greater tendency to self monitoring (28, 42). In diabetic patients there has been strong association between good metabolic control and HRQOL. As a good metabolic control marker in diabetes, HbA1C has been associated with PF and RP domains of the SF-36 in our study.

HRQOL and Diabetic Retinopathy

It has been shown by Redekop et al (16, 21) that diabetic retinopathy has a considerable impact on the HRQOL of type 2 diabetic patients. However Brown et al (4, 11) have shown that there has been no statistical difference between patients with retinopathy and normal acuity and patients without retinopathy. It has been shown that diabetic retinopathy affect HRQOL only if it causes impaired visual acuity. In our study we have found that retinopathy affected only GH domains of the HRQOL. It has not been surprising that most of the patients had mild retinopathy and their visual acuity has been limitedly affected. In our opinion, it's the severity of retinopathy that affects HRQOL.

HRQOL and Extremity Complications

Foot ulcers are one of the most troublesome complications of the diabetes. Patients need a considerable amount of time for healing so they spend their times on clinic visits, hospitalization and frequent ulcer dressings. The presence of a foot ulcer also creates anxiety due to a possibility of amputation. It has been shown in different studies that extremity problems has had a negative effect on HRQOL (31, 47). In our study we showed that extremity complications affected PF, GH, VT, SF and MH domains of the SF-36.

HRQOL and Gastrointestinal Complications

The prevalence of GI symptoms seems to be increased in people with diabetes mellitus compared to general population (32-34) (48-50). However the results of the other studies were not same (35, 51). It was shown that the quality of life scores in all domains of the SF-36 decreased markedly with increasing number of distinct GI symptoms by Talley et al. (36, 52). It was also reported that independent from age, gender, smoking and alcohol usage, this effect was especially more significant in type 2 diabetics with poorer quality of life. This is the only study that has focused on the effects of GI symptoms on HRQOL. Diabetic complications and other parameters having an effect on quality of life, for example glycemic control has not been considered in this study. In regression analysis we have not shown any independent effects of gastrointestinal complications of the diabetes on HRQOL. This different result may be depending on our study design or our patients didn't have many GI symptoms.

Strong evidence has been found for the power of disease specific, demographic and psychosocial factors to influence functional status and well-being in patients with diabetes. These considerations have substantial and clinical implications (10, 15). It has also been reported by Rubin et al that from research perspective, the strong covariance between a variety of physiologic, behavioral, attitudinal, and demographic parameters and quality of life in people who have had diabetes, make monocausal hypotheses or statements about general quality of life of limited value (37, 53). Studies conducted by different authors have also found that the presence of two or more diabetes related complications have been associated with a significant increase in meaningful symptoms of depression or anxiety. In our study we have investigated many various parameters that have had affect on HRQOL. We thought that our results supported this statement as in the literature. All parameters which we have included in our study may have an effect on HRQOL. At the beginning of the study we thought that HRQOL in patients with diabetes might be affected by various factors so we included many factors and parameters in our study but there were no parameter about the psychosocial parameters like anxiety and depression which is a limitation. We did not find monocausal model for diabetic complications that has affect on HRQOL in regression analysis models.

We conclude that monocausal theories could not explain the effects of diabetes on HRQOL. Because of this, interventions which improve HRQOL in diabetic patients should be developed for multidimensional purposes. Patient's physiological, demographic, behavioral and attitudinal characteristics and the effects of diabetic complications should be evaluated together. Because of these multidimensional necessities, educational and counseling programs should be developed for multidimensional purpose by professional education teams.

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