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Original Article

Quality of life in subjects with type 2 diabetes mellitus with diabetic retinopathy: A case–control study

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ABSTRACT

Aims: Diabetic retinopathy (DR) as a common complication of Type 2 Diabetes Mellitus (T2DM) affecting negatively quality of life (QoL). Assessing of QoL in patients with DR is a prerequisite for the evaluation of their needs and for understanding the perception of the patients themselves about their health status and how the disease affects their lives. Additionally, QoL indicators detect individual psychosocial problems that may impact therapeutic response.

Materials and methods: A total of 70 subjects with T2DM and DR as well as 70 T2DM individuals without DR were included. For the evaluation of QoL we used (a) WHO QoL – BREF for the estimation of QoL, (b) Life Satisfaction Scale for the estimation of satisfaction from life, and (c) the special recording document for demographic, socioeconomic, and clinical data. At the same time, blood was collected for the measurement of glucose control and renal function. DR was diagnosed by dilated fundoscopy.

Results: Patients with DR had significantly worse scores in all scales of QoL and Life Satisfaction in comparison with those without DR. We found significant impact of the severity of DR in many domains of the QoL and Life Satisfaction. Multivariate logistic regression analysis demonstrated that DR was associated with worse QoL and Life Satisfaction scores as well as lower income, while no significant associations were found with education level, family, insurance and employment status as well as type of residence.

Conclusion: DR affects QoL and Life Satisfaction and is associated with lower income.

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1. Introduction

Diabetic Retinopathy (DR) is an inflammatory disease and constitutes a microvascular complication of Diabetes Mellitus (DM). Poor glycaemic regulation is mainly caused by microvascular complications to diabetic patients. DR is higher in percentage among patients suffering from T2DM (6.7%–30.2%) compared to patients suffering from T1DM (0%–3%). This difference is due to the

fact that patients suffering from T2DM, may remain undiagnosed for a prolonged period of time [1]. Visual impairments occur in 18.9% of patients with type 2 diabetes mellitus (T2DM) [2]. The WHO is estimating that DR is responsible for the 5% blindness globally, with percentages reaching up to 15–17% in developed countries [3]. The rapid increase of prevalence of DM in the future will instigate a significant raise of patients with visual impairments [4,5].

The usual estimation of the size of impairments resulting from DM, such as DR, includes neither the patients' point of view, nor the overall effect of the disease in the way of life. It is known that the general health condition of a patient is determined not only by the

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size of the disease but from other factors, psychological, cultural, professional and socioeconomical, as well.

Lately, apart from prevention, decline and deceleration of the impairments of the disease, care for the quality of life, which means preservation and improvement of the patients' general well – being is included in the basic goals of DM management.

Quality of life (QoL) is most salient as official term in health and a measurement is particularly important to be used as an assessment index of therapeutic intervention for every patient, particularly in subjects with chronic diseases such as DM [6].

Since the last decade, 1,950,000 articles have been published regarding the quality of life when suffering from DM [7]. The inveteracy of the disease and its complications often create a decrease to the quality of life of a patient with DM. This kind of deficit, contains at the same time both an objective and a subjective dimension, a fact indicating the many faceted meaning of the term “quality of life” [8]. Research on the QoL in patients with DM initiated in the 1980's and evolved in the 1990's.

The World Health Organization reports that the QoL is the subjective perception people maintain regarding their place in life within the cultural frames and system of values of the society in which they live, dependent upon their personal goals, expectations, concerns and ideals. It is a wide concept, affected by an individual's physical health, their psychological condition, defense system, social relationships and last but not least the relationships with the characteristics of one's environment. It is about a subjective definition as emphasis is given in the way a person himself evaluates their quality of life. (WHOQOL group, 1995) [9]. Corresponding international researches oriented to the investigation of QoL, used various questionnaires both general and specific, conceptually defined towards the disease given. The QoL fluctuates according to each patient's personality and character. With regards to literature data, some of the most important factors comprising an obstacle to the QoL of patients with diabetes, are the negative cognitive and emotional reactions towards the disease, stress, depression as well as one's eating habits [10].

In Greece, the relevant literature and research is extremely limited. In addition, available Greek literature does not focus on the effects of DR on QoL in patients with DM. However, several international studies have demonstrated that patients with DR have worse indices of QoL in relation to the general population [11–13]. Other also studies, reported on the changes in QoL in people with DR [14]. For this very reason an increase in their QoL could offer valuable information on how the disease affects all aspects of their health and become the cornerstone for the provision of holistic care oriented to their needs.

The aim of this cross-sectional observational study was to evaluate the impact of DR on measures of QoL using validated tools like the WHOQOL – BREF and Life Satisfaction of Diener scale. Moreover, we examined the association between measures of QoL and demographic, clinical and biochemical data.

2. Materials and Methods

We included in the study consecutive subjects with T2DM aged 18–75 years with stable antidiabetic treatment in the 3 months prior to inclusion in the study. Exclusion criteria were as follows: type 1 diabetes mellitus; subjects unable to communicate and answer to the questions; unwillingness to participate in the study; hemodialysis; history of past or current malignant diseases; history of psychiatric diseases and/or current use of antipsychotic medications other than sedatives; blindness; and history of major amputations. A case - control study was conducted; controls and cases were matched for gender in a ratio 1:1. A total of 182 subjects were screened. The final sample was consisted of 70 patients with T2DM

and DR (cases) and 70 subjects with T2DM without retinopathy (controls) monitored in the outpatient Diabetes Clinic of the Laiko General Hospital in Athens, Greece. A total of 42 subjects were excluded because they did not fulfill the inclusion/exclusion criteria ($n = 36$) or because they denied completing the questionnaires ($n = 6$). The data collection lasted 2 years, from 10/2015 to 12/2017 and was realized after personal communication with the patients participating in the research through (a) the Greek version of WHO Quality of Life – BREF for the estimation of the quality of life, (b) the Greek version of Life Satisfaction, for the estimation of satisfaction from life and (c) the special recording document for demographic and clinical data. For this particular study specifically, the tool WHOQOL – BREF was chosen, since it has been for years the official tool of WHO for the issues of the Quality of Life. Among the 50 languages that has been translated and used is the Greek language too. It is easy to use, combining simplicity and plenitude in fields defining the Quality of Life against other tools. WHOQOL – BREF contains 26 questions. In order to provide a wide and comprehensive assessment 1 out of the 24 fields of WHOQOL – 100 is included in the latest version of it. Furthermore, the first 2 questions have been included concerning the overall quality of life and general health, as they are self – defined by the respondent. The 26-items version is rated on a 5-point Likert scale, with higher scores indicating positive item assessment. All scores were transformed to a 0–100 scale, in accordance with the WHO guidelines. The WHOQOL – BREF fields include terms such as general, physical, and mental health as well as social relationships and environment. The translation, the scoring match and the validation of the questionnaire for the Greek population was made by the Athens Medical School in collaboration with the Eginition Psychiatric Hospital under the auspices of the World Health Organization [15].

Moreover, the Greek questionnaire' version for WHOQOL (DWHOQOL-BREF) was used; DWHOQOL-BREF contains four new national items and facets within existing domains in the WHOQOL – BREF; Facet: Nutrition 1. How healthy and suitable to your needs is the nutrition that you follow? Facet: Satisfaction with work 2. How much satisfied are you with your job and the employment you have? Social relationships domain Facet: Social life 3. How much satisfied are you with your own social roles and the social activities you are involved with? Facet: Home life 4. How much satisfied are you with your home life? [15].

The tool 'satisfaction with life scale' (SWLS) is a 5-item scale that designed to measure global cognitive judgments of one's life satisfaction (not a measure of either positive or negative affect). Participants indicate how much they agree or disagree with each of the 5 items (SWB1–5) using a 7-point scale that ranges from 7 strongly agree to 1 strongly disagree; the items are as follows; SWB1: In most ways my life is close to my ideal; SWB2: the conditions of my life are excellent; SWB3: I am satisfied with my life; SWB4: So far I have gotten the important things I want in life; and SWB5: If I could live my life over, I would change almost nothing [16]. The SWLS is shown to be a valid and reliable measure of life satisfaction, suited for use with a wide range of age groups and applications, which makes possible the savings of interview time and resources compared to many measures of life satisfaction. In addition, the high convergence of self- and peer-reported measures of subjective well-being and life satisfaction provide strong evidence that subjective well-being is a relatively global and stable phenomenon, not simply a momentary judgment based on fleeting influences [16]. The total score between the 5 questions was calculated in order to examine to overall life satisfaction between the two groups. A total score 20–24 is an average score regarding life satisfaction scale and 15–19 is slightly below average in life satisfaction score system [16].

We collected socioeconomic data regarding education, family,

employment, and insurance status, the house they are staying and income. Education level was classified in 3 scales as graduates from the primary (6 years of education), secondary (12 years of education), and tertiary education (more than 12 years of education). Regarding employment status, participants were classified as employee, unemployed, and retired. Participants were also questioned about the type of residence (flat or detached house), whether the house they were staying was privately owned or rented or hosted, whether or not they had private insurance, the marital status (single, married, divorced, widowed), and income. Income was divided in 3 scales: < 880 Euros/month, 881–1760 Euros/month, and >1761 Euros/month.

All eligible participants underwent a thorough ophthalmological examination by an experienced ophthalmologist through fundoscopy after pupil dilatation. We used the criteria of the American Diabetes Association for the diagnosis and classification of DR [17]. Patients with DR (cases) were classified as having mild non-proliferative NPDR (microaneurysms), moderate NPDR (swelling and distortion of the blood vessels that nourish the retina and some of them are blocked depriving blood supply to the retina), severe NPDR (many more blood vessels are blocked, depriving blood supply to areas of the retina), and proliferative diabetic retinopathy (PDR) (growth of new blood vessels on the retina and posterior surface of the vitreous).

Body weight and height were measured in light clothing. Blood samples were collected for measurement of fasting serum glucose and creatinine as well as glycated hemoglobin (HbA1c). Estimated glomerular filtration rate (eGFR) was calculated using the modification of diet in renal disease study equation (MDRD) [18].

2.1. Statistical analysis

The statistical analysis of the data was carried out with the Statistical Software SPSS (IBM SPSS software version 24.0 for Windows, Armonk, NY, USA). All data were tested for normality using the Shapiro–Wilk test. Continuous variables with normal distribution are presented as mean \pm SD, those with skewed distribution as median (interquartile range), whereas categorical variables by frequency distribution tables. Differences between the two groups regarding baseline data were assessed using the student-*t*-student for continuous variables, the Mann-Whitney test for non-parametric data and the chi-square test for categorical variables. Analysis of variance (ANOVA) was performed to examine for differences in the outcome variables between participants without DR and those with mild or moderate/severe DR. Post-hoc analysis was performed to look for differences between the groups using the least significant square difference method. Because only 3 patients had severe NPDR, they were combined in the group of participants with moderate NPDR. Multivariate logistic regression analysis was performed to look for associations between DR status (dependent variable) and the study parameters. Since parameters of QoL were highly correlated each other, to avoid multicollinearity we created several logistic regression analysis models; we used a core model with variables found to be associated significantly with DR status including age, body weight, height, duration of diabetes and eGFR and each one of the study variables were added in the core model consecutively. Statistical significance was at $p < 0.05$ (two-tailed).

Table 1
Demographic, socioeconomic, clinical and biochemical parameters in subjects without (controls) and in subjects with diabetic retinopathy (cases).

	Controls	Cases	p
	n	70	70
Female/male n (%)	38 (54.3)/32 (45.7)	38 (54.3)/32 (45.7)	1.000
Age (years)	60.9 \pm 5.9	65.0 \pm 4.5	<0.001
Weight (kg)	75.4 \pm 14.6	83.6 \pm 15.9	0.002
Height (cm)	172.5 \pm 9.5	168.7 \pm 10.3	0.022
Duration of diabetes (years)	11.2 \pm 2.23	14.1 \pm 3.11	<0.001
Glucose (mg/dl)	137.8 \pm 37.7	153.6 \pm 35.1	0.011
Creatinine (mg/dl)	0.86 \pm 0.15	1.04 \pm 0.23	<0.001
eGFR (ml/min/1.73m ²)	63.1 \pm 9.1	75.5 \pm 16.7	<0.001
HbA1c (%)	7.20 \pm 0.88	7.56 \pm 0.87	0.017
Use of insulin n (%)	10 (14.3)	60 (85.7)	
Use of antidiabetic medications other than insulin n (%)	60 (85.7)	10 (14.3)	<0.001
Family status n (%)			
Single	4 (5.7)	4 (5.7)	
Married	44 (62.9)	53 (75.7)	
Divorced	15 (21.4)	4 (5.7)	
Widow/widower	6 (8.6)	9 (12.9)	
No answer	1 (1.4)	0	
Educational level n (%)			
Primary education	16 (22.9)	23 (32.9)	
Secondary education	36 (51.4)	37 (52.9)	
Tertiary education	18 (25.7)	10 (14.3)	
Employment n (%)			
Employee	50 (71.4)	33 (47.1)	
Unemployed	3 (4.3)	5 (7.1)	
Retired	15 (21.4)	32 (45.7)	
No answer	2 (2.9)	0	
Private insurance (yes) n (%)	11 (15.7)	7 (10)	
Home: flat/detached n (%)	65 (92.9)/5 (7.1)	60 (85.7)/10 (14.3)	
Home owned/Rented/Hospitality n (%)	49 (70)/18 (25.7)/3 (4.3)	50 (71.4)/20 (28.6)/0/0	
Income n (%)			
<880 Euros/month	26 (22.9)	33 (47.1)	
881-1760 Euros/month	31 (44.3)	33 (47.1)	
>1761 Euros/month	23 (32.9)	4 (5.7)	

Data are shown as means \pm SD or as n (%). HbA1c: glycated hemoglobin; eGFR: estimated glomerular filtration rate.

Table 2

The results of the WHQOL-BREF Domains and Satisfaction With Life Scale in non-diabetic subjects without (controls) and with diabetic retinopathy (cases).

	Controls	Cases	p
	n	70	70
WHQOL-BREF Domains			
Overall QoL/General health	3.70 ± 0.56	2.42 ± 0.79	<0.001
Physical health	3.16 ± 0.23	3.05 ± 0.34	0.021
Mental health	3.26 ± 0.27	3.04 ± 0.47	0.001
Social relationships	3.50 ± 0.44	2.98 ± 0.51	<0.001
Environment	3.26 ± 0.36	3.00 ± 0.35	<0.001
DWHOQOL-BREF			
Physical health domain			
Facet: Nutrition 1	3.54 ± 0.58	3.07 ± 0.72	<0.001
Facet: Satisfaction with work 2	3.29 ± 0.71	2.81 ± 0.70	<0.001
Social relationships domain			
Facet: Social life 3	3.56 ± 0.60	3.17 ± 0.63	<0.001
Facet: Home life 4	3.43 ± 0.66	2.75 ± 0.88	<0.001
Satisfaction With Life Scale			
SWB1	4.59 ± 0.79	3.30 ± 1.06	<0.001
SWB2	4.53 ± 0.96	3.14 ± 1.25	<0.001
SWB3	4.64 ± 0.95	3.07 ± 1.24	<0.001
SWB4	4.40 ± 1.19	3.30 ± 1.34	<0.001
SWB5	4.14 ± 0.15	3.27 ± 1.48	<0.001
Satisfaction with life (total score)	22.30 ± 4.29	16.09 ± 5.54	<0.001

Data are shown as mean ± SD. QoL: quality of life; DWHOQOL-BREF: New national items and facets within existing domains; SWB1-5: subjective well-being.

3. Results

Cases were older, had greater body weight and lower height, longer diabetes duration, higher eGFR and worse diabetes control than controls. In addition, cases were more likely to be married and retired and had lower income. No significant differences were found in education level, type of residence, ownership of the residence and the type of insurance (private insurance or not) (Table 1).

The comparison of WHQOL-BREF domains between cases and

controls showed that general, mental, and psychological health, as well as social relationships and environment were significantly worse in participants with DR; the same was valid for the DWHOQOL-BREF domains (Table 2).

All SWLS were all significantly worse in cases than in controls. In addition, the total SWLS was significantly lower in cases than in controls (16.09 ± 5.54 vs. 22.30 ± 4.29, $p < 0.001$) (Table 2).

We compared participants without DR and those with mild and moderate/severe retinopathy, using ANOVA to examine for differences in QoL parameters according to the presence and severity of DR (Table 3). All WHQOL-BREF domains, DWHOQOL-BREF domains, and SWLS were significantly worse in the participants with mild or moderate/severe DR as compared to participants without DR; from the WHQOL-BREF domains, mental and social health were significantly worse in subjects with moderate/severe DR than those with mild DR. From the DWHOQOL-BREF domains, the facet N3 (social life) tended to be worse in the participants with moderate/severe DR as compared to those with mild DR ($p = 0.053$). From the SWLF, SWB1 (in most ways my life is close to my ideal, $p = 0.042$) and SWB3 (I am satisfied with my life, $p = 0.045$) were significantly worse in participants with moderate/severe DR than in those with mild DR (Table 3).

Multivariate logistic regression analysis demonstrated significant positive associations between DR status and age ($p = 0.015$), body weight ($p = 0.004$), diabetes duration ($p = 0.002$), and eGFR ($p = 0.002$) and negative association with height ($p = 0.003$) and income ($p = 0.002$). Significant negative associations were found with all satisfaction with life scales as well as with the total score of SWLF scale (all p values < 0.05), from the WHOQOL-BREF domains with social relationships ($p = 0.015$), and from the DWHOQOL-BREF domains with nutrition ($p = 0.009$) and home life ($p = 0.002$) (Table 4). No significant relationships were found with HbA1c, use of insulin, education level, family and employment status, type of residence, ownership of the residence, and the type of insurance (Table 4).

Table 3

The results of the WHQOL-BREF Domains and Satisfaction With Life Scale in diabetic subjects without (DR-) and in subjects with mild (mild DR) and moderate/severe (moderate/severe DR) diabetic retinopathy.

	DR-	mild DR	moderate/severe DR	p	p*	p**	p***
	70	49	21				
WHQOL-BREF Domains							
Overall QoL/General health	3.70 ± 0.56	2.53 ± 0.79	2.19 ± 0.76	<0.001	0.135	0.008	0.060
Physical health	3.16 ± 0.23	3.08 ± 0.34	2.96 ± 0.33	0.020	<0.001	0.008	0.135
Mental health	3.26 ± 0.27	3.15 ± 0.39	2.78 ± 0.44	<0.001	0.115	<0.001	<0.001
Social relationships	3.50 ± 0.44	3.03 ± 0.53	2.85 ± 0.46	<0.001	<0.001	<0.001	<0.001
Environment	3.26 ± 0.36	3.04 ± 0.35	2.92 ± 0.34	<0.001	0.001	<0.001	0.219
DWHOQOL-BREF							
Physical health domain							
Facet: Nutrition 1	3.54 ± 0.58	3.08 ± 0.73	3.05 ± 0.74	<0.001	<0.001	0.003	0.844
Facet: Satisfaction with work 2	3.29 ± 0.71	2.80 ± 0.73	2.86 ± 0.65	0.001	<0.001	0.018	0.743
Social relationships domain							
Facet: Social life 3	3.56 ± 0.60	3.27 ± 0.63	2.95 ± 0.59	<0.001	0.012	<0.001	0.053
Facet: Home life 4	3.43 ± 0.66	2.74 ± 0.86	2.78 ± 0.97	0.001	<0.001	0.019	0.897
Satisfaction With Life Scale							
SWB1	4.59 ± 0.79	3.45 ± 1.08	2.95 ± 0.97	<0.001	<0.001	<0.001	0.042
SWB2	4.53 ± 0.96	3.29 ± 1.33	2.81 ± 0.98	<0.001	<0.001	<0.001	0.102
SWB3	4.64 ± 0.95	3.24 ± 1.26	2.67 ± 1.11	<0.001	<0.001	<0.001	0.045
SWB4	4.40 ± 1.19	3.35 ± 1.37	3.19 ± 1.28	<0.001	0.002	0.001	0.639
SWB5	4.14 ± 0.15	3.37 ± 1.48	3.05 ± 1.49	<0.001	<0.001	<0.001	0.359
Satisfaction with life (total score)	22.30 ± 4.29	16.69 ± 5.69	14.67 ± 5.01	0.001	<0.001	<0.001	0.117

Data are shown as mean ± SD. QoL: quality of life; DWHOQOL-BREF: New national items and facets within existing domains; SWB1-5: subjective well-being. P values are for the comparisons among the study groups by ANOVA; p^* values are for the comparisons between DR- and mild DR groups; p^{**} values are for the comparisons between DR- and moderate/severe DR groups; p^{***} values are for the comparisons between mild DR and moderate/severe DR groups.

Table 4

The association [odds ratio (OR) with 95% confidence intervals (95% CI)] between diabetic retinopathy status (with and without diabetic retinopathy) and study parameters by bivariate logistic regression analysis.

Variable	OR	95% CI	p
Core model			
Age (years)	1.30	1.05–1.61	0.015
Weight (kg)	1.18	1.05–1.33	0.004
Height (cm)	0.77	0.65–0.91	0.003
Diabetes duration (years)	2.23	1.33–3.75	0.002
Use of insulin (yes/no)	0.49	1.85–16.82	0.697
HbA1c (%)	1.58	1.29–1.91	0.091
eGFR (ml/min/1.73 m ²)	1.07	1.09–1.13	0.002
Variables consecutively tested after adjustment for variables included in the core model*			
Income (highest vs. medium and lower)	0.51	0.33–0.78	0.002
Ownership of the residence (yes vs. no)	0.68	0.22–2.05	0.810
Type of residence (flat vs. detached)	1.04	0.52–1.30	0.623
Private insurance. (yes vs. no)	1.15	0.34–3.85	0.810
Education (primary vs. secondary/tertiary)	0.97	0.50–1.13	0.94
Employee/retired vs. unemployment)	1.33	0.74–2.39	0.340
Family status (marries vs. singles/divorced/widowed)	0.51	0.25–1.01	0.051
WHQOL-BREF Domains			
General health	0.04	0.01–0.18	<0.001
Physical health	1.15	0.20–6.47	0.862
Mental health	0.93	0.23–3.69	0.918
Social relationships	0.24	0.07–0.75	0.015
Environment	0.19	0.03–1.08	0.061
DWHOQOL-BREF Domains			
Nutrition 1	0.38	0.18–0.78	0.009
Satisfaction with work 2	0.72	0.37–1.41	0.262
Social relationships domain			
Social life 3	0.47	0.22–1.01	0.053
Home life 4	0.15	0.04–0.51	0.002
Satisfaction With Life Scale			
SWB1	0.26	0.12–0.54	<0.001
SWB2	0.39	0.22–0.67	0.001
SWB3	0.30	0.16–0.55	<0.001
SWB4	0.56	0.36–0.88	0.013
SWB5	0.15	0.35–0.87	0.011
Satisfaction with life (total score)	0.78	0.69–0.89	<0.001

*Adjustment for age, weight, height, duration of diabetes, and eGFR. HbA1c: glycated hemoglobin; eGFR: estimated glomerular filtration rate; DWHOQOL-BREF: New national items and facets within existing domains; SWB1-5: subjective well-being (for definitions see the text).

4. Discussion

The aim of the current study was to evaluate QoL of patients with T2DM diagnosed with DR, in comparison with those without DR by taking into consideration demographic, socioeconomic and clinical data. DR is a common complication of diabetes mellitus and a leading cause of blindness. This is the first case control study in Greek population that tried to validate the findings of previous studies in the association of DR and the reduction in patients' QoL. Analyzing the factors that may affect QoL of patients with DR we could design a better health care protocol in order to improve QoL especially for patients with lower income and education status.

The present study shows that the QoL was significantly lower in individuals with T2DM who have DR than those without DR. This result is in accordance with many studies that had also demonstrate both the qualitative and quantitative reduction in QoL in patients with DR [11,13,19–23]. In a Chinese study which conducted by Goh et al., the multiethnic environment diabetic complications had also a great impact on QoL [24]. Additionally, our study showed that the age, the income and the education status were determinants for a better life in both patients with and without DR. These results have also been confirmed from previous studies

[25,26].

DR has a major impact on physical and mental health as compared to subjects without DR. Since it is a disease that affects their daily routine and reduce the levels of their independence, the patients' social relationships will be also unsettled. Moreover, the glycemic control was worse in the group of cases and this can impact life dissatisfaction in these patients, while the commoner use of insulin by cases did not affect QoL. Similar findings were reported by Coffey et al. in 2048 individuals with diabetes showing that health scores were significantly lower (0.052–0.170) in subjects with either type 1 or T2DM with DR [27].

Pereira and colleagues report that as with all chronic diseases, patients with DR suffer from physical and mental trauma [13]. This finding is justified because both the illness and the accompanying losses often make the patient feel that he has lost control of both his body and his life, as well as causing fear, sadness, insecurity and other negative emotions. Generally, patients with better psychologically health have better compliance to medical instructions, more effective management of their disease and better QoL [28]. For this reason, the use of psychotherapeutic and psycho-educational interventions aiming at improvement of glycemic control and QoL as well as of emotional representations of their self can improve compliance to treatment of diabetes. Therefore, processing the concerns and feelings of these patients in a supportive psychotherapeutic environment becomes a necessity [29,30]. In this way, patients with DR will be able to accept their illness, develop the necessary skills for improving glycemic control, as well as acquiring awareness, self-knowledge and autonomy in order to be in charge of their own lives and to attain the primary therapeutic goal of QoL.

Some limitations of our study should be mentioned. In spite of the fact that the present study is a first attempt to investigate the quality of life of patients with DR in Greece, a larger sample size could be more representative for the Greek population and increase the precision of the newly estimated parameters. In this study we manage to include patients with mild and moderate DR and a few cases with more severe DR; therefore, the results of this study cannot be extrapolated to subjects with more severe DR. Another limitation is that the changes in the progression of DR in relation to QoL issues are not available.

This study has shown that patients with T2DM and DR had lower levels of QoL and satisfaction from their life comparing to healthy individuals. QoL issues should be taken into consideration by clinicians in order to design the appropriate interventions. Diabetes per se affects major aspects of QoL and especially the physical and mental health. Furthermore, special attention must be given to the prevention and management of chronic diabetes complications. One issue that is usually ignored in everyday clinical practice is how crucial is the personality and emotional reactions of the patient diagnosed with DR, and how these reactions can impact compliance to treatment and glycemic control. Clearly, more research is needed in the field of the impact of DR on QoL issues and SWLS and it is important to examine prospectively whether psychological interventions can improve QoL and compliance to treatment in patients with DR.

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Appendix A. Supplementary data

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