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Psychosocial factors and health-related quality of life in hemodialysis patients

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Abstract

Several sociodemographic and clinical variables are known to influence the health-related quality of life (HRQOL) of patients with kidney disease, yet the relationship between psychological factors and the HRQOL measured by the Kidney Disease Quality of Life Short-Form (KDQOL-SF) is incompletely understood. The objective of this study was to examine the relationship between psychosocial status (depressive symptoms, trait anxiety, and social support) and KDQOL-SF scales in hemodialysis (HD) patients by controlling the effects of sociodemographic and clinical variables. The HRQOL of 194 patients from 43 dialysis centers in Spain was assessed by completing the KDQOL-SF, and evaluating depressive symptoms (Cognitive Depression Index), trait anxiety (Trait Anxiety Inventory) and degree of social support (Scale of Perceived Social Support). We also recorded several sociodemographic and clinical variables. Two regression models were estimated for each of the 19 scales in the KDQOL-SF. In the first model, we only included sociodemographic and clinical-factors, while the second model also took into consideration psychosocial variables. These last factors (trait anxiety and depressive symptoms, not social support) were found to increase the proportion of explained variability, with highest standardized regression coefficients observed for most KDQOL-SF scales. Depressive symptoms were related to a poor HRQOL when there was a strong physical component, while trait anxiety was mainly related to emotional upset and social relationships. We were able to conclude that trait anxiety and depressive symptoms are strongly associated with the HRQOL assessed by the KDQOL-SF in HD patients. The effects of these factors should therefore be considered when evaluating the quality of life of this type of patient.

Key words: Anxiety, Depression, Health-related quality of life, Hemodialysis, Social support

Introduction

Currently, the management of patients with end stage renal disease (ESRD) undergoing hemodialysis (HD) includes among its objectives the assessment of health-related quality of life (HRQOL) aimed at its improvement or preservation. This practice requires the identification of variables potentially affecting the HRQOL. The wide range of questionnaires available for assessing HRQOL in patients with ESRD includes both generic and disease-targeted questionnaires. Generic questionnaires assess health concepts that represent basic human values and are relevant to everyone's health status and well-being. Disease-specific measures assess the special states and concerns of patients with a given illness, for example, disease symptoms and/or side effects of treatment [1]. However, generic and specific outcome measures probe an ESRD patient's functioning and well-being in a relatively independent manner, and the use of several questionnaires or one that considers both generic and disease-specific factors is therefore recommended [2]. The Kidney Disease Quality of Life (KDQOL) [3] is a multidimensional, reliable, and validated questionnaire specifically designed for dialysis patients. It has a generic core: the 36-Item Short Form Health Survey (SF-36) [4], and is supplemented with multi-item scales targeted at the particular concerns of dialysis patients. To date, the factors explaining the HRQOL of HD patients as measured by the generic and specific scales of the KDQOL are poorly defined. The scarce number of studies that have evaluated determinants affecting specific dimensions of the KDQOL include estimates of the influence of ethnicity [5] and Kt/V [6]. Many more investigations have examined the SF-36, and these have served to identify the effects of the sociodemographic factors: age [7, 8], gender [7, 9], socioeconomic level [10], and employment status [11]; and the clinical factors: comorbidity [7, 11], low levels of hemoglobin and a low hematocrit [12], low levels of albumin [13], time on dialysis [8], and the conditions under which dialysis was initiated [14]. Nonetheless, these two groups of variables (sociodemographic and clinical) as a whole have only been able to explain a small percentage of the variation of generic dimensions of HRQOL shown by kidney disease patients [7, 11]. Some dimensions of HRQOL, specifically related to the kidney disease and HD treatment, such as a higher symptom burden, satisfactory sleep, effect of kidney disease and burden of kidney disease, have a substantial additional effect on HRQOL impairment as defined by the SF-36 score [7, 15]. However, a large proportion of the variability shown by each scale of the SF-36 and the specific scales of the KDQOL questionnaire is still unexplained, indicating that other factors must also determine the perception of health status by this population of patients. One of these factors could be the patient's psychosocial status since any two patients with similar medical and sociodemographic characteristics may have very different perceptions of health and of how the disease state interferes with his/her life, given the possible influence of depression and social support among other variables [16].

This study was designed to assess the effects of psychological distress (measured as trait anxiety and depressive symptoms) and social support in HD patients on self-reported HRQOL, measured by the generic and specific scales of the KDQOL Short-Form (KDQOL-SF).

Methods

Patients

The study population was comprised of 194 patients from 43 hemodialysis centers in Spain. Patients had to meet the following inclusion criteria: age over 18, absence of vascular access problems, at least 3 months since the start of dialysis treatment, at least 3 months of erythropoietin (EPO) treatment, and at least 3 months since the last major complication (requiring hospitalization of 7 days or more, or with defined consequences). Patients were excluded if they had a diabetic nephropathy, given the particular features of this type of patient including a marked discrepancy between medical and psychological aspects of HRQOL: they had worse HRQOL in physical dimension [9, 17], although they had better HRQOL in psychological and social dimension [18] than renal patients without diabetes.

Instruments

We analyzed the following major categories of data: demographic, clinical, psychosocial, and HRQOL.

The demographic variables considered were age, sex, marital status, place of residence, social status, level of education, and employment status.

The clinical characteristics included were: primary kidney disease, comorbidity measured by the Friedman Comorbidity Index [19], the time the patient had been on dialysis, the time from diagnosis and start of dialysis, previously failed kidney transplant, use of EPO, hemoglobin, and serum albumin concentration. The dialysis variables taken into account were Kt/V and protein catabolic rate (PCR).

We evaluated the psychosocial variables: depressive symptoms, trait anxiety, and social support. Depressive symptoms were assessed using the Cognitive Depression Index (CDI) [20], which is a subscale of the Beck Depression Inventory (BDI) [21], composed of 15 of its 21 items (excluding the somatic items). The use of the cognitive BDI items as a separate index has occurred in response to the need for a measure of depression in chronic patients that is relatively free of the possible confounding effects of illness and treatment symptoms [20]. The 15 items, as with all BDI items, are answered in a four-point Likert scale ($0 =$ absence of problem, $3 =$ an extreme problem; total score range 0–45). In a sample of patients with renal disease, this index showed a standardized internal consistency of Cronbach's $\alpha = 0.74$ [20]. CDI show high correlation with mortality and it is a better measure of depression than the BDI in patients with CRI [22]. In this study Cronbach's α coefficient was 0.83.

The trait anxiety scale of the State-Trait Anxiety Inventory (STAI-T) was used to evaluate levels of anxiety [23]. The scale includes 20 items that rate the relatively stable tendency to perceive situations as threatening and consequently increase the state of anxiety. The scale includes 20 items answered on a four-point Likert scale ($0 =$ no such feeling, $3 =$ strong feeling; total score range 0–60). For definition of scores as normal or pathological, they were compared with the Spanish general population distribution [23]: scores at or above the 75th percentile are classified as pathological. This instrument shows high internal consistency (Cronbach's $\alpha = 0.91$) and good test-retest reliability ($r = 0.86$) [23]; and in our study Cronbach's α was also high ($\alpha = 0.88$).

Finally, social support perceived by the patient since the onset of illness was evaluated using the Scale of Perceived Social Support (SPSS) [24]. This instrument quantitatively and qualitatively evaluates perceived support (familial, extrafamilial, and health team) since the onset of the disease. Total score on this subscale may range from 10 to 50, with higher values indicating higher satisfaction. Internal consistency as assessed from our data was acceptable (Quantity of social support: Cronbach's $\alpha = 0.70$; Social satisfaction: Cronbach's $\alpha = 0.81$).

Health-related quality of life was established using a version of the KDQOL-SF adapted to the Spanish population [25]. This is a self-report instrument that is both generic and specific, combining the advantages of comparability (associated with generic instruments) and specificity and sensitivity (characteristics of specific instruments) in a single questionnaire. The KDQOL-SF is comprised of 36 items of a general health nature as eight scales: physical functioning (10 items), role-physical (four items), pain (two items), general health perception (five items), energy/fatigue (four items), social function (two items), role-emotional (three items) and emotional well-being (five items). In addition to these generic items, 43 items specific to kidney disease complete the survey. These make up the 11 scales: symptoms/problems (12 items), effects of kidney disease (eight items), burden of kidney disease (four items), work status (two items), cognitive function (three items), quality of social interaction (three items), sexual function (two items), sleep (four items), social support (two items), dialysis staff encouragement (two items) and patient satisfaction (one item). For each scale, the score obtained is adapted to 0–100, with higher values indicating a higher HRQOL. This instrument has shown good psychometric properties (except for quality social interaction all scales show Cronbach's α values of 0.70 or more) [25]. In our study, Cronbach's α indices exceeded 0.70 for all the scales, except for quality of social interaction, work status, social support, and sleep.

Procedure

The study was cross-sectional and included patients selected from the Nephrology Units of the different Spanish regions. At each center, the clinical data form was filled in by the nephrologist managing the patient and the demographic data form was completed during an interview with the patient. The different assessment scales were then given to the patients, who completed the questionnaires at home (or during dialysis at hospital) and returned them at the next dialysis session. To make sure the patients adequately completed the questionnaires, the instructions were read out and an example given. For illiterate patients and patients with reading and writing deficiencies, the questionnaires were administered orally during an interview.

Statistical analysis

The clinical, sociodemographic, and psychosocial variables of the study population are presented as the frequencies of each qualitative variable, and the mean and standard deviation of the quantitative variables. To assess the impact of illness on each KDQOL-SF scale, the mean and standard deviation of the scores was calculated, as well as the proportion of individuals reporting maximum scores (ceiling effect) and minimum scores (floor effect). Univariate associations between KDQOL-SF scores and psychosocial variables, and among the psychosocial variables themselves were assessed by Pearson's correlation coefficient. To estimate the effects of psychosocial factors (trait anxiety, depressive symptoms, and social support) on each KDQOL-SF scale, we compared two multiple linear regression (Ordinary Least Square – OLS) analyses. Each KDQOL-SF scale was included in the regression equation as a dependent variable. The first analysis included only sociodemographic and clinical variables as the independent variables. The psychosocial variables (anxiety, symptoms, and social support) were added in the second regression analysis. In this second model, we examined the coefficients of the psychosocial factors and we also compared the R^2 between the two models to determine whether including these variables would explain the additional variance. For each KDQOL-SF scale, a backward procedure was used as a selection strategy to specify the regression model. Variance index factors (VIF) were computed to detect multicolinearity, which was corrected by computing the difference from the mean of anxiety and depression scores [26]. We did not use the principal component method to reduce the number of variables to one common factor because we wanted to measure the effect of each individual variable. The significance tests for all estimated variables were two-tailed tests at $p < 0.05$. The software used was SPSS 11.0 for Windows.

Results

The study population of 194 patients included 84 men and 110 women between the ages of 19 and 86 years (48.55 ± 16.06 years). Table 1 shows the main demographic, clinical, and psychosocial characteristics of the patients.

Trait anxiety scores (21.89 ± 11.13) for the population were comparable to mean normative scores reported for the Spanish population [23]. By standardizing the scores obtained using these norm values, 42 patients (21.6%) were classed as scoring above the 75 percentile.

The mean CDI score was 5.29 ± 5.42. According to the procedure described by Sacks et al. [20] for the CDI, the subset of cognitive scores was weighted as 21 items to directly compare CDI and BDI scores. Consequently, each cognitive subset score was multiplied by 21/15 and an estimate of the total BDI score was calculated. The estimated mean values BDI obtained were below the threshold for depression (7.77 ± 7.71), although 54 patients (27.8%) presented estimated total score BDI > 10 indicating symptoms of depression [21]. Social support reported by these patients, both in terms of quantity (6.34 ± 2.01) and the degree of satisfaction (29.58 ± 9.29), was generally high.

Analysis of the impact of kidney disease and HD treatment on HRQOL (see Table 2), indicated that patients felt they were most affected by general health perceptions, role-physical and energy/fatigue. Among the specific items, the patients identified work status, followed by burden of kidney disease and effects of kidney disease as the main factors affecting their quality of life.

We next tried to establish relationships between psychosocial variables (trait anxiety, depressive symptoms and social support) and KDQOL-SF ratings. The univariate associations observed indicated that trait anxiety and depressive symptoms were significantly related to all the KDQOL-SF ($p < 0.01$) scales, with the exception of depressive symptoms and sexual function ($r = -0.11$; $p = 0.160$) and depressive symptoms and dialysis staff encouragement ($r = -0.12$; $p = 0.137$). Social support was only related to social function ($r = 0.16$; $p = 0.02$), energy/fatigue ($r = 0.16$; $p = 0.02$), emotional well-being ($r = 0.17$; $p = 0.01$), work status ($r = 0.19$; $p = 0.007$), and patient satisfaction ($r = 0.20$; $p = 0.004$). Some of these relationships between psychosocial variables and KDQOL-SF scores disappeared in the multivariate regression analysis.

The results of the first regression analysis (model 1, including only clinical and sociodemographic variables) of the generic scales of the KDQOL-SF (see Table 3) indicated a proportion of explained variance that ranged from 0.00 for the energy/fatigue scale to 0.360 for the physical functioning

Table 1. Sociodemographic, clinical, and psychosocial characteristics of the sample

Sociodemographic variables		Clinical variables		Psychosocial variables	
Age (years)		Months on hemodialysis		Anxiety trait	
Mean ± SD (range)	48.55 ± 16.06 (19–86)	Mean ± SD (range)	43.86 ± 45.79 (3–312)	Mean ± SD (range)	21.89 ± 11.13 (1–52)
Sex		Months from diagnosis to initiation of hemodialysis treatment			
Men N (%)	84 (43.3%)				
Women N (%)	110 (56.7%)				
		Mean ± SD (range)	56.46 ± 65.25 (0–336)		
				CDI	5.29 ± 5.42 (0–28)
Marital status		No. of previous transplants		Mean ± SD (range)	
Single, divorced or widowed N (%)	65 (33.5%)	None N (%)	138 (71.1%)		
Married or living with a stable partner.		1 N (%)	42 (21.6%)		
N (%)	127 (65.5%)	2 or more N (%)	7 (3.6%)		
Place of residence		No. of hospitalizations during prior year		Social support	
Rural N (%)	50 (25.8%)			Quantity of social support	
Urban N (%)	140 (72.2%)			Mean ± SD (range)	
		None N (%)	133 (68.5%)	Total network	6.34 ± 2.07 (0–10)
		1 N (%)	40 (20.6%)	Family network	2.54 ± 0.98 (0–4)
		2 or more N (%)	17 (8.8%)	Extra-family network	1.56 ± 1.01 (0–3)
				Health provider network	1.87 ± 0.46 (0–2)
Social class		No. of days hospitalized during prior year		Social satisfaction	
Lower N (%)	8 (4.1%)			Mean ± SD (range)	
Middle N (%)	179 (92.3%)			Total social satisfaction	29.58 ± 9.29 (8–50)
Upper N (%)	–	Mean ± SD (range)	17.86 ± 18.78 (1–90)	Family Satisfaction	12.40 ± 4.44 (2–20)
				Extra-family Satisfaction	8.13 ± 3.57 (1–15)
				Health provider Satisfaction	8.82 ± 1.67 (2–10)
Level of education		Treatment with EPO-rHu N (%)	170 (87.6%)		
Illiterate N (%)	5 (2.6%)				
Reads an writes only N (%)	24 (12.4%)				
Primary N (%)	89 (45.9%)	Hemoglobin (g/dl)			
Secondary N (%)	52 (26.8%)	Mean ± SD (range)	11.33 ± 1.33 (8.4–15.2)		
College N (%)	19 (9.8%)				
		% Hematocrit			
Employment status		Mean ± SD (range)	34.40 ± 4.30 (23–43)		
Active N (%)	32 (16.5%)				
Not active (unemployed, retired, homemaker) N (%)	155 (79.9%)	Albumin (g/dl.)			
		Mean ± SD (range)	4.15 ± 4.30 (3–5.2)		
		Kt/V			
		Mean ± SD (range)	1.24 ± 0.21 (0.6–1.9)		
		PCR (g/kg/d)			
		Mean ± SD (range)	1.14 ± 0.21 (0.5–1.9)		
		Comorbidity Index			
		Mean ± SD (range)	3.86 ± 2.0 (0–13)		

Table 2. Internal consistency, mean scores, standard deviations, range, and percentage of maximum (ceiling) and minimum (floor) scores for each KDQOL-SF scale

KDQOL-SF scales	α	Mean	SD	Range	% Floor	% Ceiling
Generic						
Physical functioning	0.87	67.43	23.37	0–100	0.5	1.0
Role-physical	0.89	48.02	43.17	0–100	35.0	31.4
Role-emotional	0.88	77.36	37.67	0–100	14.9	68.0
Social function	0.70	73.96	24.61	0–100	0.5	30.4
Pain	0.81	65.71	27.89	0–100	16	20.6
Energy/fatigue	0.85	53.69	24.06	0–100	3	21.1
Emotional well-being	0.88	68.30	22.53	4–100	0	8
General health	0.73	39.21	19.65	0–90	1.0	0
Specific						
Burden of kidney disease	0.71	43.32	24.48	0–100	3.6	1.5
Cognitive function	0.76	78.82	20.25	0–100	1.0	24.7
Symptoms	0.79	77.92	14.40	29.17–100	0	0.5
Effects of kidney disease	0.78	58.56	20.32	0–100	0.5	0.3
Sexual function	0.92	62.13	34.55	0–100	8.2	26.2
Sleep	0.67	65.14	19.35	12.5–100	0	3
Social support	0.57	78.76	20.42	0–100	1.1	30.4
Work status	0.46	29.73	35.59	1–100	52.6	12.9
Quality of social interaction	0.42	81.31	16.57	13.33–100	0	21.1
Patient satisfaction	NA	79.70	19.72	33.33–100	0	37.1
Dialysis staff encouragement	0.78	84.02	19.60	0–100	0.5	44.3

NA: Not applicable

scale. When the psychosocial variables were included (model 2), the proportion of explained variance increased to values of 0.198 for the energy/fatigue scale and 0.556 for the emotional well-being scale. The largest increases in explained variance occurred in the scales assessing mental health components, i.e., emotional well-being and the mental component summary. Lowest increases were observed in scales including a strong physical component, i.e., physical functioning, general health perception and the physical component summary.

Of all the generic scales of quality of life considered, trait anxiety and/or depressive symptoms were associated with a lower HRQOL and in most cases showed the highest standardized regression coefficients. Trait anxiety was associated with a lower HRQOL in terms of role-physical, general health perception, role-emotional, and social function; this being the only independent factor related to HRQOL for these last two scales. The factor depressive symptoms were negatively related to the scales of physical functioning, pain and energy/fatigue. Trait anxiety and depressive symptoms jointly explained the low HRQOL in the emotional well-being domain. High levels of social satisfaction were associated with higher HRQOL in the areas pain and emotional well-being.

In the physical component summary, the psychosocial variable associated with a low HRQOL was depressive symptoms, while, in the mental component summary, trait anxiety was negatively related to HRQOL (see Table 3)

Findings related to the specific quality of life aspects evaluated by the KDQOL-SF, indicated a general increase in explained variance when the psychosocial variables were introduced in the regression model (except for dialysis staff encouragement) (see Table 4). Greatest increases were observed in the domains symptoms/problems, quality of social interaction and sleep.

In the specific scales, trait anxiety and/or depressive symptoms were once again found to be related to a poorer HRQOL for most of the dimensions examined. Trait anxiety was associated with burden of kidney disease, cognitive function, effects of kidney disease, sexual function, social support, work status, quality of social interaction, and patient satisfaction, while depressive symp-

Table 3. Standardized regression coefficients *(B)* and proportion of total variance explained (R^2) in the two regression models for each generic scales and the physical and mental summary indexes of the KDQOL-SF™

	Generic scales of the KDQOL-SF ™																Physical component summary		Mental component summary	
	Physical functioning		Role-physical		Role-emotional		Social function		Pain		Energy/fatigue		Emotional well-being		General health perception					
	M1	M2	M1	M2	M1	M2	M1	M2	M1	M2	M1	M2	M1	M2	M1	M2	M1	M2	M1	M2
	B	*B*	*B*	*B*	*B*	*B*	*B*	*B*	*B*	*B*	*B*	*B*	*B*	*B*	*B*	*B*	*B*	*B*	*B*	*B*
Sociodemographic variables																				
Sex	−0.278	−0.212	–	–	−0.264	–	−0.210	–	–	–	–	–	−0.331	−0.159	–	–	–	–	−0.343	
Age	−0.436	−0.507	–	–	0.187	–	–	–	–	–	–	−0.162	–	–	–	–	−0.212	−0.297	–	–
Social status	–	–	0.192	0.182	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Employment status	0.208	0.219	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Clinical variables																				
No. Previous transplant	–	–	–	–	–	–	–	–	–	–	–	–	–	−0.112	−0.217	−0.217	–	–	–	−0.148
Comorbidity	−0.346	−0.318	–	–	–	–	–	–	–	–	–	–	–	–	−0.252	−0.219	−0.254	−0.178	–	–
Albumin	–	–	0.262	0.248	–	–	–	–	–	–	–	–	−0.253	−0.221	–	–	–	0.182	−0.206	−0.245
Hemoglobin	–	–	–	–	–	–	–	–	0.219	0.207	–	–	–	–	–	–	–	–	–	–
Psychosocial variables																				
Trait anxiety	–	–	–	−0.445	–	−0.567	–	−0.590	–	–	–	–	–	−0.463	–	−0.416	–	–	–	−0.649
Depressive symptoms	–	−0.380	–	–	–	–	–	–	–	−0.395	–	−0.437	–	−0.193	–	–	–	−0.340	–	–
Satisfaction social	–	–	–	–	–	–	–	–	–	0.197	–	–	–	0.156	–	–	–	–	–	–
R^2	0.360	0.459	0.105	0.325	0.102	0.316	−0.044	0.348	0.048	0.255	0.00	0.198	0.144	0.556	0.100	0.265	0.130	0.304	0.135	0.505
R^2 change	0.099		0.220		0.214		0.304		0.207		0.198		0.412		0.165		0.174		0.370	

B, Standardized regression coefficients; M1, model 1, in which sociodemographic and clinical variables were used as independent variables; M2, model 2 in which sociodemographic, clinical and psychosocial variables were used as independent variables;

Note, all variables were forced into the models; only effects significant at $p < 0.05$ are shown.

Table 4. Standardized regression coefficients (*B*) and proportion of total variance explained (R^2) in the two regression models for each of the specific scales of the KDQOL-SF

	Burden of kidney disease		Cognitive function		Symptoms /problems		Effects of kidney disease		Sexual function		Sleep		Social support		Work status		Quality of social interaction		Patient satisfaction		Dialysis staff encouragement	
	M1	M2	M1	M2	M1	M2	M1	M2	M1	M2	M1	M2	M1	M2	M1	M2	M1	M2	M1	M2	M1	M2
	B	*B*	*B*	*B*	*B*	*B*	*B*	*B*	*B*	*B*	*B*	*B*	*B*	*B*	*B*	*B*	*B*	*B*	*B*	*B*	*B*	*B*
Sociodemographic variables																						
Sex	−0.199	–	–	–	–	–	–	–	–	–	–	–	0.303	0.376	–	–	–	–	–	0.206	–	–
Age	–	−0.197	–	–	–	–	–	–	−0.390	−0.424	–	–	–	–	–	−0.102	−0.290	–	–	0.214	–	–
Social class	0.193	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Employment status	–	–	0.279	0.224	–	–	–	–	–	–	–	–	–	–	0.581	0.512	−0.234	–	–	–	–	–
Clinical variables																						
No previous transplants	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	−0.180	–	–	–	–
Comorbidity	−0.194	–	–	–	−0.273	−0.272	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Albumin	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	−0.275	−0.275
Hemoglobin	–	–	–	–	–	–	0.209	0.182	–	–	–	–	−0.199	–	–	–	–	–	−0.276	–	–	–
Psychosocial variables																						
Trait anxiety	–	−0.364	–	−0.454	–	–	–	−0.418	–	−0.261	–	–	–	−0.289	–	−0.168	–	−0.310	–	−0.315	–	–
Depressive symptoms	–	−0.225	–	–	–	−0.499	–	–	–	–	–	−0.503	–	–	–	–	–	−0.258	–	–	–	–
R^2	0.086	0.308	0.078	0.307	0.074	0.371	0.044	0.244	0.152	0.222	0.00	0.253	0.178	0.256	0.337	0.386	0.106	0.398	0.076	0.287	0.076	0.076
R^2 change	0.222		0.229		0.297		0.200		0.068		0.253		0.078		0.049		0.292		0.211		0.00	

B, Standardized regression coefficients; M1, model 1, in which sociodemographic and clinical variables were uses as independent variables; M2, model 2, in which sociodemographic, clinical and psychosocial variables were used as independent variables,

Note: all variables were forced into the models; only effects significant at $p < 0.05$ are shown toms was correlated with burden of kidney disease, symptoms/problems, sleep and quality of social interaction. In most cases, both these variables showed the highest standardized regression coefficients, suggesting these factors also had the greatest power of explanation for many of the specific quality of life domains of these patients.

Discussion

The present findings indicate that the psychosocial variables trait anxiety and depressive symptoms substantially affected the way in which patients evaluated their HRQOL. These psychosocial variables were able to explain additional variance in KDQOL-SF scores above that accounted for by sociodemographic and clinical factors. The data obtained in the multivariate analyses are consistent with previous findings [7, 11] that point to the significance of several sociodemographic variables (female gender, advanced age, low social status, and nonworking status) and clinical factors (high comorbidity, low hemoglobin levels, previously failed transplants, and low levels of albumin) in the lowest scores obtained in the generic and/or specific scales of the KDQOL-SF. However, as shown by previously published data [7, 11], the percentage of explained variance is small and, except for two scales (physical functioning and work status), does not exceed 0.25, the threshold above which percentages of variance are considered acceptable [26]. Nevertheless, when psychosocial variables were introduced in the regression models, the proportion of variance accounted for increased to values between 0.198 for the energy/fatigue scale, and 0.556 for emotional well-being. The dialysis staff encouragement scale was an exception. Here, the percentage of explained variance was small ($R^2 = 0.076$) and did not change when psychosocial variables were included. This is probably due to the fact that scores for this scale are not essentially determined by the characteristics of the patients, but rather by other variables not considered in the present study such as the characteristics of the dialysis staff.

In the specific areas of the KDQOL-SF, the percentage of explained variance did not attain the values reached in some generic scales (for example, emotional well-being $R^2 = 0.556$; mental component summary $R^2 = 0.505$; physical functioning $R^2 = 0.459$), though in general (except the dialysis staff encouragement scale) the levels recorded here were close to or above 0.25 (0.222–0.398). This suggests the possibility that other factors not considered in this study may play a significant role in the more specific dominions such as the way the patient approaches his/her the illness and/or HD treatment. These factors may include coping strategies [27] and self-concept [28], among others. Future studies could be designed to determine the explanatory contribution of these variables to quality of life aspects specifically related to kidney disease.

Trait anxiety and/or depressive symptoms were associated with poorer HRQOL in generic and specific scales of KDQOL-SF, with a high power of explanation in most cases. This finding is in agreement with those observed by Martin and Thompson [29] in patients on continuous ambulatory peritoneal dialysis. As might be expected, by including psychological variables in the regression model it was possible to account for more of the variance recorded in scales related to mental health (especially emotional well-being and the mental component summary). However, it should also be noted that trait anxiety and/or depressive symptoms were also found to contribute to the perception of physical status (e.g., physical functioning, pain, symptoms/problems), functional capacity (role-physical, work status) and social functioning (social function, quality of social interaction). This suggests that psychological variables in patients on HD are associated with decreased physical, mental and social functioning. The relationship observed between anxiety and depressive symptoms and the HRQOL among patients undergoing HD becomes particularly relevant when we consider that these are the psychological disturbances most frequently found in renal patients [30]. The present data also indicate that trait anxiety ratings accounted for a statistically significant proportion of the total variance in areas related to emotional upset and social relationships (mental component summary, role-emotional, social function, social support) while depressive symptom ratings were more linked to dimensions with a strong physical component (physical component summary, physical functioning, pain, symptoms/problems).

Contrary to the effects of anxiety and depression, social support was found to be significantly related to only two domains: pain and emotional well-being. These findings contrast with previous studies [31, 32] that describe the correlation of social support and HRQOL. It is unclear whether this discrepancy is related to a high level of social support in our sample. A more in-depth study of social support would be called for.

In conclusion, our findings indicate that trait anxiety and depressive symptoms are crucial when assessing HRQOL using the KDQOL-SF. The effects of these two psychological factors need to be taken into account when interpreting this assessment of health status. The patient's psychological state should be considered when we interpreted KDQOL-SF scores, especially if this information is then used to compare patients or populations. Indeed, the effects of anxiety and depression could help clarify the confusion sometimes faced by clinicians when their patients show clinical features that suggest moderately good health yet report major restrictions in their activities or quality of life. Finally, it would be useful to establish whether worse HRQOL scores are in fact dependent on emotional status to help design treatment strategies for individual patients. Psychosocial interventions focused on potentially modifiable factors, such as depression and anxiety, might be used in addition to standard medical treatment in an attempt to improve HRQOL in some HD patients.

Our study is nevertheless not without its limitations. The population size is modest and corresponds to a single country. The study participants were also relatively young (mean age was 48.5 ± 16.06 years) and free of diabetes or vascular access problems, factors which could have significant effects on HRQOL. Consequently, the contribution of anxiety and depressive symptoms to a patient's self-reported HRQOL described here would only hold for patients of similar characteristics as ours. There is thus a clear need for further work aimed at determining the specific contribution of these factors to the HRQOL in patients of different demographic and clinical characteristics. Further, this single cross-sectional evaluation of the patient cohort does not allow prediction of the direction of causality. It is difficult to draw conclusions regarding causality by correlation and regression analysis. Finally, the possible influence of several intervening or confounding factors, such as body mass index, exercise level, nutritional status, alcohol and caffeine intake or smoking, was not considered. Future longitudinal studies including more biological and psychological variables are needed to obtain insight into the long term effects of chronic dialysis treatment, including trait anxiety and depressive symptoms, on the quality of life perceived by dialysis patients according to the KDQOL-SF.

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Appendix

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