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RESEARCH ARTICLE (ORIGINAL)

Quality of life of people with chronic kidney disease undergoing regular hemodialysis

Qualidade de vida na pessoa com insuficiência renal crónica em programa regular de hemodiálise

Calidad de vida en personas con insuficiencia renal crónica en programa regular de hemodiálisis

Abílio José Borges Silva [1]
https://orcid.org/0000-0002-3807-9960

João Frazão [1]
https://orcid.org/0000-0002-8081-5474

Rui Pimenta [2]
https://orcid.org/0000-0002-1985-8395

[1] DaVita Portugal, Portugal

[2] Higher School of Health- Polytechnic of Porto and CEISUC-CIBB, Portugal

Corresponding author
Abílio José Borges Silva
E-mail: abilio.silva@davita.com

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Abstract
Background: The number of people suffering from chronic kidney disease undergoing hemodialysis in Portugal has been increasing over the last decade, highlighting the need to assess the quality of life of these patients.
Objective: To assess the quality of life of patients with chronic kidney disease undergoing regular hemodialysis.
Methodology: A quantitative, cross-sectional descriptive study was conducted using the Kidney Disease Quality of Life Instrument (KDQOL-SF Version 1.3). The non-probability convenience sample consists of 268 patients aged 25 to 90 years undergoing regular hemodialysis in seven clinics in Portugal.
Results: The Dialysis staff encouragement (82.46) and social support (77.49) dimensions had the highest scores. Male patients had higher scores in the physical functioning ($p = 0.023$),bodily pain ($p = 0.011$), and emotional well-being ($p = 0.020$) dimensions. This sample had statistically significant lower scores in all domains of the 36-Item Health Survey (SF-36) than the general Portuguese population.
Conclusion: It is essential to develop strategies to improve the quality of life of patients with chronic kidney disease.

Keywords: quality of life; chronic kidney disease; hemodialysis

Resumo
Enquadramento: Ao longo da última década observou-se um aumento no número de pessoas que sofrem de doença renal crónica em programa de hemodiálise, imergindo a necessidade de aferir a qualidade de vida destes doentes.
Objetivo: Avaliar a qualidade de vida dos doentes renais crónicos em programa regular de hemodiálise.
Metodologia: Estudo de abordagem quantitativa, descritivo transversal utilizando o KDQOL-SF. Amostra não probabilística de conveniência, com 268 doentes em programa regular de hemodiálise com idades entre 25 e 90 anos, em sete clínicas de Portugal.
Resultados: O encorajamento do pessoal da diálise (82,46) e o apoio social (77,49) foram as dimensões com melhores scores. Os indivíduos do sexo masculino apresentam melhores pontuações na qualidade de vida, nas dimensões: função física ($p = 0,023$), dor ($p = 0,011$) e bem-estar emocional ($p = 0,020$). A análise do SF-36 demostrou que todos os domínios apresentavam pior score e com significado estatístico quando comparados com a população portuguesa.
Conclusão: É fundamental arranjar estratégias que possam melhorar qualidade de vida da pessoa com insuficiência renal.

Palavras-chave: qualidade de vida; doença renal crónica; hemodiálise

Resumen
Marco contextual: En la última década ha aumentado el número de personas con insuficiencia renal crónica que se someten a un programa de hemodiálisis, lo que plantea la necesidad de evaluar la calidad de vida de estos pacientes.
Objetivo: Evaluar la calidad de vida de los pacientes renales crónicos en programa regular de hemodiálisis.
Metodología: Se trata de un estudio cuantitativo, transversal y descriptivo que utiliza el KDQOL-SF. Muestra de conveniencia no probabilística, con 268 pacientes en programa regular de hemodiálisis con edades comprendidas entre los 25 y los 90 años, en siete clínicas de Portugal.
Resultados: La motivación del personal de diálisis (82,46) y el apoyo social (77,49) fueron las dimensiones con las mejores puntuaciones. Los individuos del sexo masculino presentan mejores puntuaciones en calidad de vida, en las dimensiones: función física ($p = 0,023$), dolor ($p = 0,011$) y bienestar emocional ($p = 0,020$). El análisis del SF-36 demostró que todos los dominios presentaban una puntuación peor y con significación estadística en comparación con la población portuguesa.
Conclusión: Es esencial idear estrategias que puedan mejorar la calidad de vida de las personas con insuficiencia renal.

Palabras clave: calidad de vida; enfermedad renal crónica; hemodiálisis

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Introduction

Chronic diseases are one of the major problems for medicine and health sciences. It is one of the leading causes of the difference between mortality and comorbidity rates, that is, the gap between life expectancy and quality of life (QoL).

Chronic kidney disease (CKD) is characterized by a progressive and irreversible loss of kidney function due to multiple factors affecting kidney structure and function. It is a long-term and insidious condition, often asymptomatic in the early stages. This disease is a public health problem due to the increase in its incidence and prevalence rates (Medeiros et al., 2015).

The number of patients with CKD undergoing hemodialysis has been increasing over the last decade. According to the national registry, there were around 12,458 patients with CKD in Portugal in 2020, representing an increase of 77% compared to 2000 (Galvão et al., 2021).

Since CKD is one of the most demanding chronic diseases, requiring treatment at least three times a week, this increase has led to many questions about these patients' QoL. This study aimed to assess the QoL of patients with CKD undergoing regular hemodialysis. It also aimed to explore the association between the sociodemographic variables (age, gender, residence, and education level) and the QoL of patients with CKD undergoing regular hemodialysis.

Background

Mejia and Merchán (2007) mention that QoL is a broad and multidimensional concept that covers personal aspects such as health, autonomy, independence, and life satisfaction, as well as environmental factors such as the support network and social services. Other authors argue that QoL is the individual's perception of their position in life in the context of the culture and values in which they are inserted and in relation to their goals, expectations, standards, and concerns. It is associated with physical health, psychological state, level of independence, social relationships, personal beliefs, and features of the environment (Pretto et al., 2020).

QoL is strongly linked to self-concept and individual well-being, encompassing several aspects such as physical capacity, social and economic status, emotional balance, social interactions, mental activity, self-sufficiency, family support, health status, cultural, ethical and religious values, lifestyle, satisfaction at work and in daily activities, and the environment (Gomes et al., 2021).

Given the comorbidity and mortality rates, assessing the QoL of patients undergoing hemodialysis is crucial, thus increasing their rehabilitation potential.

According to Skoumalova et al. (2021), the QoL of people with CKD is lower than in the general population and tends to decrease with disease progression. Decreased kidney function affects patients' QoL through symptom burden such as frailty, fatigue, pain, poorer physical functioning, weakness, and cramps. QoL is associated with other factors such as the form of renal replacement therapy, the type of vascular access, the efficacy of hemodialysis, the presence of comorbidities, social support, marital and socioeconomic status, coping strategies, and psychological well-being, namely depression and anxiety. Hemodialysis can influence patients' biological, psychological, economic, and social dimensions and interfere with their QoL. Patients with CKD tend to have lower QoL, a characteristic already associated with the growing number of people with CKD (Gomes et al., 2021).

Persistent uncertainty about the diagnosis, prognosis, evolution, and treatment of the disease inevitably leads to an emotional impact and persistent physical and functional limitations that affect daily routines, interfering with the ability to work, perform family and social roles, and participate in recreational activities (Ribeiro, 2019).

Socioeconomic parameters have a major impact on disadvantaged populations. Job loss caused by the disease could be tackled by strengthening social protection measures and retraining to adapt to its physical effects. Understanding patients' sociocultural environment is key to effective healthcare. A better understanding of QoL and its determinants contributes to designing individualized strategies and treatments (Manavalan et al., 2017). Low education levels and unemployment were significantly and independently associated with low levels of QoL in patients with CKD.

Zahid et al. (2021) analyzed the QoL of patients with CKD and found a significant association with the variables of age, monthly income, marital status, and occupation. The study showed that CKD negatively affects patients' QoL, influencing their mental health, physical capacity, and personal life. No significant results were obtained for residence, gender, and health status.

Hypotheses

H1 - Patients with CKD have worse QoL than the general population; H2 - Patients with lower education levels have worse QoL than patients with higher education levels; H3 - Younger patients have better QoL than older patients; H4 - Patients' QoL is the same in the North, Center, and Lisbon and Tagus valley regions; H5 - Male patients have better QoL than female patients.

Methodology

This quantitative, descriptive cross-sectional study used the Kidney Disease Quality of Life Instrument (KDQOL-SF) to assess the QoL of patients with CKD. Data were collected between March 1 and April 30, 2022, in seven hemodialysis clinics in the North, Center, and Lisbon and Tagus Valley regions of Portugal.

The study population consists of people with CKD undergoing regular hemodialysis in hemodialysis clinics in the North, Center, and Lisbon and Tagus Valley regions of Portugal.

The following inclusion criteria were applied: patients over 18 years of age; diagnosis of CKD (stage 5); voluntary participation in the study; ability to give their written informed consent to participate in the study. Exclusion criteria were being unable to read and write Portuguese and not having intact cognitive functions assessed by a health professional participating in the study.

The questionnaire and the informed consent form were given to patients who agreed to participate in the study. Data were aggregated to protect participant anonymity. Participants were selected from patients attending clinics in the North, Center, and Lisbon and Tagus Valley regions who agreed to participate voluntarily in the study. Although the clinics belong to a single company, they reflect geographic diversity. The criteria used in the placement of patients undergoing hemodialysis depend only on criteria predefined by health policies. Although it is a non-probability convenience sample, it will be treated as a probability sample for the reasons described above. The sample consisted of 268 out of 12,458 patients, with a margin of error of 5.92%.

In addition to the KDQOL-SF, the questionnaire included questions on the sociodemographic characteristics of the sample, namely age, gender, education level, and duration of hemodialysis.

Data collection tool

The KDQOL-SF was used for data collection. It is a specific QoL assessment tool for patients on dialysis proposed by Hays et al. (1995). This instrument has 43 kidney-disease items grouped into 11 dimensions and 36 questions grouped into nine dimensions (36-Item Health Survey, SF-36) validated for the Portuguese population by Ferreira and Santana (2003).

Sample bias was minimized with a correct study design, a representative sample of the population, and a self-administered questionnaire, limiting the information bias. Given that some dimensions of the KDQOL-SF have only two items, some instability was expected in its internal consistency using Cronbach's alpha, as occurred in the validation for the Portuguese population. Nevertheless, Cronbach's alpha was lower than 0.70 in only five of the 19 dimensions for which internal consistency was calculated (Burden of kidney disease, $\alpha = 0.63$; Quality of social interaction, $\alpha = 0.38$; Sleep, $\alpha = 0.57$; Social functioning, $\alpha = 0.33$; and Work status, $\alpha = 0.57$).

Data were analyzed IBM SPSS statistics, version 26.0. Absolute (n) and relative frequencies were used in descriptive statistics for categorical variables and means (Md) and standard deviations for continuous variables (age and duration of hemodialysis).

The psychometric properties of the KDQOL-SF 1.3 were assessed by calculating internal consistency using Cronbach's alpha and item-total correlation. Internal consistency was considered adequate if α: 0.70 and item-total correlation was above 0.30.

Analysis of variance (ANOVA) was performed after checking the assumptions to compare the dimensions of the KDQOL-SF 1.3 with categorical variables with three or more groups. The assumption of normality was checked using the Kolmogorov-Smirnov test, while homogeneity of variance was assessed using Levene's test. Differences between groups were assessed with Tukey's multiple comparison test. Spearman's correlation coefficient was used to asses associations with the variables of age and duration of hemodialysis. The chi-square goodness-of-fit test was used to assess whether frequency distribution differed from a theoretical distribution on the SF-36 survey. The significance level to reject the null hypothesis was 5%.

Results

The mean age [standard deviation (*SD*)] of participants was 66.38 (12.45) years, and the mean duration of treatment (*SD*) was 5.35 (5.61). Patients were mainly from the Center region ($n = 112$; 41.8%), but with a high prevalence of the Lisbon and Tagus Valley ($n = 81$; 30.2%) and North ($n = 75$; 28.0%) regions. They were mostly men ($n = 177$; 66.0%). Their education level was predominantly low, with almost 50% of them having completed up to 4th grade ($n = 130$; 48.5%), followed by 9th grade ($n = 58$; 21.7%) and 12th grade ($n = 51$; 19.0%). Only 28 (10.4%) had completed higher education. A large percentage of patients were retired ($n = 216$; 80.6%), only 31 (11.5%) were employed, 16 (6.0%) were unemployed, and one was a student.

Figure 1 shows that Work status (26.77) and Burden of kidney disease (29.20) had the lowest scores, while Dialysis staff encouragement (82.46) and Social support (77.99) had the highest scores.

Figure 1

Mean scores of the KDQOL-SF dimensions

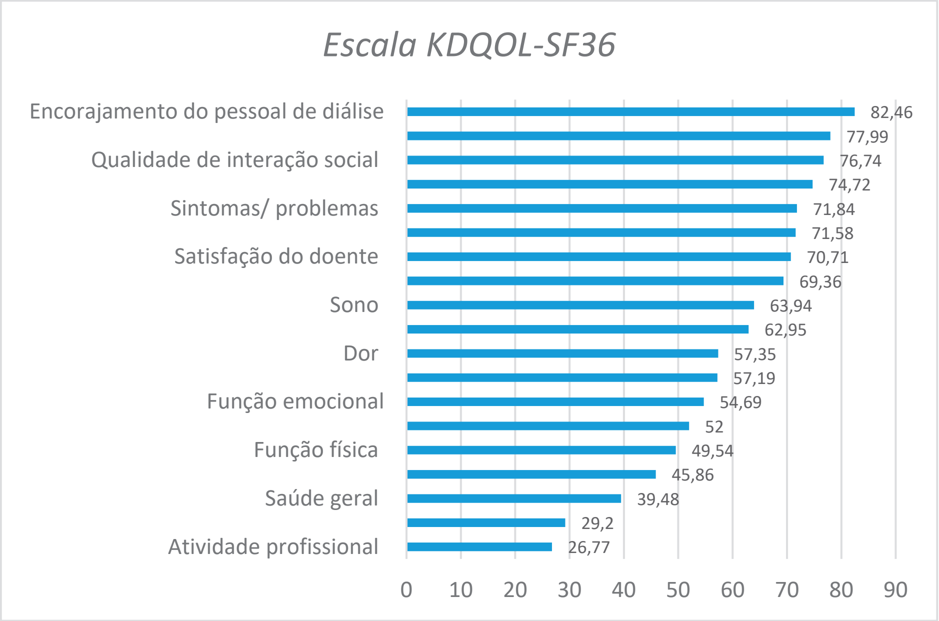

Table 1 compares the SF-36 domains in this study and in the sample of Ferreira and Santana (2003), who established the standard values for the Portuguese population. All dimensions had lower scores in this sample compared to the standard values for the Portuguese population. There is statistically significant evidence ($p < 0.001$) that patients with CKD have lower QoL than the rest of the population.

Table 1

Student's t-test – Statistical Inference SF-36 domains

36-Item Health Survey (SF-36)	Standard value	Sample value	*p*-value
Physical functioning	75.27	49.54	$p < 0.001$
Physical role	71.21	45.86	$p < 0.001$
Pain	63.34	57.35	$p < 0.001$
General health	55.83	39.48	$p < 0.001$
Emotional well-being	64.04	59.36	$p < 0.001$
Emotional functioning	73.56	54.69	$p < 0.001$
Social functioning	74.95	57.19	$p < 0.001$
Energy/fatigue	58.43	52.00	$p < 0.001$

Table 2 shows that the lowest education level (completed 4th grade) was associated with lower scores in the dimensions of Work status (F = 7.45, $p < 0.001$) compared to secondary and higher education; lower scores of Dialysis staff encouragement (F = 3.89, $p = 0.010$) compared to higher education; lower scores of Physical functioning (F = 13.75, $p < 0.001$) compared to basic, secondary, and higher education; lower scores of Physical role (F = 5.83; $p = 0.001$) compared to secondary and higher education; lower scores of Pain (F = 3.40; $p = 0.018$) compared to basic education; lower scores of Emotional well-being (F = 5.49; $p = 0.001$) compared to secondary education; lower scores of Emotional functioning (F = 6.44; $p < 0.001$) compared to basic, secondary, and higher education; lower scores of Energy/fatigue (F = 4.43; $p = 0.005$) compared to basic education; and lower scores of General health perceptions (F = 5.39; $p = 0.001$) compared to secondary and higher education. The dimensions of Work status, Cognitive function, Physical role, Emotional well-being, Emotional functioning, Energy/fatigue, and General health perceptions had a statistically significant negative association with age, although with a small effect size (< 0.30). The correlation was moderate in Physical functioning ($r_s = -0.383$, $p < 0.001$), suggesting that older patients have a greater physical impairment. Thus, it can be inferred that patients with lower education levels have worse QoL than those with higher education levels.

Table 2

Association between the KDQOL-SF and the education level

KDQOL-SF	Completed 4^{th} grade	Completed BE	Completed SE	Completed HE	ANOVA
Targeted Areas					
Symptoms/problems	69.39 (19.69)	73.66 (18.51)	73.63 (16.01)	76.12 (20.08)	F = 1.52; $p = 0.0209$
Effects of kidney disease on daily life	59.48 (24.76)	66.06 (21.33)	69.13 (21.20)	60.42 (24.07)	F = 2.52; $p = 0.059$
Burden of kidney disease	2.48 (20.54)	30.23 (22.61)	34.88 (26.16)	35.94 (22.48)	F = 2.16; $p = 0.094$
Work status	17.74 (30.04)$^{3.4}$	30.19 (33.02)	34.00 (40.96)^{1}	50.00 (46.90)^{1}	**F = 7.45; $p < 0.001$**
Cognitive function	71.46 (21.67)	77.19 (18.39)	78.43 (17.36)	77.86 (19.21)	F = 2.25; $p = 0.083$
Quality of social interaction	74.27 (22.10)	80.00 (19.15)	78.17 (15.89)	78.81 (16.03)	F = 1.37; $p = 0.253$
Sexual function	64.24 (33.69)	71.05 (29.77)	83.82 (30.86)	77.08 (32.35)	F = 1.57; $p = 0.203$
Sleep	62.73 (17.21)	64.00 (19.75)	65.07 (17.80)	67.16 (19.12)	F = 0.52; $p = 0.670$
Social support	75.26 (29.13)	78.07 (29.24)	80.39 (24.88)	85.12 (15.94)	F = 1.20; $p = 0.312$
Dialysis staff encouragement	86.61 (20.06)^{4}	81.36 (23.04)	79.00 (26.54)	71.43 (29.63)^{1}	**F = 3.89; $p = 0.010$**
Patient satisfaction	70.87 (22.61)	69.25 (22.25)	70.33 (25.26)	73.21 (24.57)	F = 0.19; $p = 0.903$
36-Item Health Survey (SF-36)					
Physical functioning	39.38 (27.33)$^{2.3.4}$	53.64 (28.26)^{1}	61.90 (27.50)^{1}	67.59 (24.35)^{1}	**F = 13.75; $p < 0.001$**
Physical role	37.87 (29.36)$^{3.4}$	50.58 (30.48)	55.00 (31.82)^{1}	56.03 (29.49)^{1}	**F = 5.83; $p = 0.001$**
Pain	51.54 (29.15)^{2}	64.87 (28.82)^{1}	58.97 (30.52)	64.29 (31.02)	**F = 3.40; $p = 0.018$**
General health	38.13 (19.11)	40.20 (17.15)	41.51 (20.10)	40.95 (19.28)	F = 0.43; $p = 0.733$
Emotional well-being	64.62 (22.73)^{3}	70.39 (20.48)	77.92 (17.20)^{1}	73.71 (18.03)	**F = 5.49; $p = 0.001$**
Emotional functioning	45.80 (29.55)$^{2.3.4}$	62.80 (29.51)^{1}	61.67 (34.5)^{1}	64.58 (31.88)^{1}	**F = 6.44; $p < 0.001$**
Social functioning	57.16 (26.64)	58.23 (31.45)	54.92 (29.80)	58.52 (33.05)	F = 0.10; $p = 0.960$
Energy/fatigue	47.17 (22.83)^{2}	53.51 (21.30)^{1}	58.60 (23.82)	58.93 (19.50)	**F = 4.43; $p = 0.005$**
General health perceptions	56.72 (14.72)$^{3.4}$	62.46 (15.25)	64.52 (15.02)^{1}	65.68 (15.99)^{1}	**F = 5.39; $p = 0.001$**

Note. BE = Basic education (Up to 9^{th} grade); SE = Secondary education (Up to 12^{th} grade); HE = Higher education; superscript values indicate statistically significant differences between groups, as assessed by Tukey's tests.

Table 3 shows that the dimensions of Work status ($p < 0.01$), Cognitive function ($p < 0.05$), Physical role ($p < 0.01$), Emotional well-being ($p < 0.05$), Emotional functioning ($p < 0.05$), Energy/fatigue ($p < 0.01$), and General health perceptions ($p < 0.01$) had a negative and statistically significant association with age, although with a small effect size ($r < 0.30$). These results suggest that older patients have a greater impairment of these functions and confirm the hypothesis that younger patients have better QoL.

Table 3

Association between the KDQOL-SF and age

KDQOL-SF	Age
Targeted Areas	
Symptoms/problems	r_s = -0.115
Effects of kidney disease on daily life	r_s = -0.047
Burden of kidney disease	r_s = -0.005
Work status	**r_s = -0.232****
Cognitive function	**r_s = -0.133***
Quality of social interaction	r_s = -0.022
Sexual function	r_s = -0.108
Sleep	r_s = -0.051
Social support	r_s = -0.069
Dialysis staff encouragement	r_s = 0.085
Patient satisfaction	r_s = -0.054
36-Item Health Survey (SF-36)	
Physical functioning	**r_s = -0.383****
Physical role	**r_s = -0.266****
Pain	r_s = -0.114
General health	r_s = 0.010
Emotional well-being	**r_s = -0.146***
Emotional functioning	**r_s = -0.134***
Social functioning	r_s = -0.088
Energy/fatigue	**r_s = -0.18**^{4**}
General health perceptions	**r_s = -0.205****

$^{*}p < .05$; $^{**}p < .01$; correlation calculated using Spearman's correlation coefficient, after checking for skewness in the distribution of the age variable.

Table 4 shows statistically significant differences in the dimensions of Dialysis staff encouragement (F = 4.72; $p = 0.010$) and Pain (F = 3.20; $p = 0.042$). In the dimension of Dialysis staff encouragement, the North region obtained higher scores than the Center and Lisbon and Tagus Valley regions. In the dimension of Pain, the North region scored higher than the Center region. These data validate the hypothesis that patients have the same level of QoL in the North, Center, and Lisbon and Tagus Valley regions.

Table 4

Association between the KDQOL-SF and the area of residence

KDQOL-SF	North[1]	Center[2]	LTV[3]	ANOVA
Targeted Areas				
Symptoms/problems	72.75 (21.21)	71.72 (18.91)	71.15 (16.62)	F = 0.14; p = 0.867
Effects of kidney disease on daily life	63.96 (23.89)	64.37 (24.19)	60.09 (22.27)	F = 0.85; p = 0.430
Burden of kidney disease	26.82 (21.49)	30.06 (23.30)	29.98 (22.23)	F = 0.36; p = 0.697
Work status	25.68 (34.37)	22.38 (34.66)	34.00 (39.56)	F = 2.32; p = 0.101
Cognitive function	75.11 (20.04)	75.33 (21.38)	73.50 (18.46)	F = 0.21; p = 0.811
Quality of social interaction	77.87 (18.92)	76.85 (21.87)	75.53 (17.85)	F = 0.27; p = 0.765
Sexual function	75.93 (28.15)	70.83 (30.81)	68.33 (37.68)	F = 0.39; p = 0.676
Sleep	65.79 (17.29)	61.84 (19.59)	64.81 (16.66)	F = 1.12; p = 0.328
Social support	80.22 (26.09)	75.15 (30.18)	79.79 (23.97)	F = 1.02; p = 0.362
Dialysis staff encouragement	88.17 (17.66)[2,3]	82.75 (24.87)[1]	76.72 (25.37)[1]	**F = 4.72; p = 0.010**
Patient satisfaction	75.56 (21.11)	69.44 (25.22)	67.90 (21.53)	F = 2.43; p = 0.090
36-Item Health Survey (SF-36)				
Physical functioning	48.31 (30.38)	46.01 (29.56)	55.57 (26.84)	F = 2.58; p = 0.078
Physical role	46.50 (30.66)	43.38 (32.23)	48.52 (29.98)	F = 0.62; p = 0.541
Pain	63.00 (29.72)[2]	52.06 (30.19)[1]	59.13 (28.94)	**F = 3.20; p = 0.042**
General health	39.28 (19.22)	38.98 (20.61)	40.36 (15.77)	F = 0.11; p = 0.894
Emotional well-being	71.15 (18.88)	67.67 (21.75)	70.00 (22.93)	F = 0.64; p = 0.527
Emotional functioning	57.33 (31.60)	50.24 (33.46)	58.11 (28.83)	F = 1.73; p = 0.179
Social functioning	62.92 (28.43)	55.07 (27.98)	54.17 (29.62)	F = 1.72; p = 0.182
Energy/fatigue	51.67 (22.81)	49.55 (22.62)	55.69 (22.76)	F = 1.70; p = 0.184
General health perceptions	61.75 (14.05)	58.92 (16.01)	61.12 (15.65)	F = 0.89; p = 0.410

Note. LTV = Lisbon and Tagus Valley; superscript numbers 1, 2, and 3 indicate statistically significant differences between groups, assessed by Tukey's tests.

Table 5 shows that male participants had statistically significant higher scores in physical functioning (t = 2.29, p = 0.023), pain (t = 2.55, p = 0.011), emotional well-being (t = 2.34, p = 0.020), and energy/fatigue. These data confirm the hypothesis that male patients have better QoL than female patients.

Table 5

Association between the KDQOL-SF and gender

KDQOL-SF	Male	Female	*t*-Test
Targeted Areas			
Symptoms/problems	73.37 (17.93)	68.68 (20.49)	*t* = 1.89. *p* = 0.060
Effects of kidney disease on daily life	64.24 (23.28)	60.44 (23.91)	*t* = 1.23. *p* = 0.219
Burden of kidney disease	29.23 (22.53)	29.13 (22.40)	*t* = 0.03. *p* = 0.978
Work status	25.90 (35.98)	28.41 (36.98)	*t* = -0.52. *p* = 0.601
Cognitive function	75.17 (20.22)	73.85 (19.97)	*t* = 0.51. *p* = 0.614
Quality of social interaction	77.82 (19.83)	74.67 (19.87)	*t* = 1.22. *p* = 0.223
Sexual function	70.91 (30.83)	73.08 (36.35)	*t* = -0.28. *p* = 0.779
Sleep	64.65 (18.63)	62.52 (16.81)	*t* = 0.87. *p* = 0.384
Social support	78.38 (27.81)	77.22 (26.38)	*t* = 0.33. *p* = 0.744
Dialysis staff encouragement	82.59 (23.79)	82.22 (23.18)	*t* = 0.12. *p* = 0.905
Patient satisfaction	70.40 (22.89)	71.30 (23.71)	*t* = -0.30. *p* = 0.767
36-Item Health Survey (SF-36)			
Physical functioning	52.49 (28.43)	43.82 (29.93)	***t* = 2.29. *p* = 0.023**
Physical role	46.02 (31.11)	45.54 (31.12)	*t* = 0.12. *p* = 0.907
Pain	60.73 (28.73)	50.89 (31.26)	***t* = 2.55. *p* = 0.011**
General health	40.26 (17.84)	37.95 (20.55)	*t* = 0.88. *p* = 0.377
Emotional well-being	71.52 (20.24)	65.08 (22.84)	***t* = 2.34. *p* = 0.020**
Emotional functioning	55.88 (31.39)	52.28 (32.32)	*t* = 0.85. *p* = 0.395
Social functioning	56.61 (28.96)	58.21 (28.54)	*t* = -0.37. *p* = 0.710
Energy/fatigue	54.49 (22.96)	47.08 (21.71)	***t* = 2.53. *p* = 0.012**
General health perceptions	61.20 (14.87)	58.77 (16.27)	*t* = 1.23. *p* = 0.221

Discussion

The results show that the dimensions with the lowest scores were Work status (26.77) and Burden of kidney disease (29.20), which is in line with Hays et al. (1995), Alisherovna et al. (2022), and Póvoa (2022). The dimensions with the highest scores were Dialysis staff encouragement (82.46) and Social support (77.99), as in the work carried out by Gerasimoula et al. (2015) and Póvoa (2022).

It should be noted that the differences in scores across the dimensions may have important clinical implications. Low scores in the dimensions of Work status and Burden of kidney disease may indicate the need for specific interventions to improve patients' QoL in these areas, such as psychosocial support, vocational rehabilitation, or weight management. On the other hand, high scores in the dimensions of Dialysis staff encouragement and Social support may suggest that they are strengths to be maintained and improved in QoL management.

This study found that patients with secondary and higher education had higher scores, suggesting a better QoL in the dimensions of Work status, Dialysis staff encouragement, Physical functioning, Physical role, Pain, Emotional well-being, Emotional functioning, Energy/fatigue, and General health perceptions. These results are aligned with those found by Manavalan et al. (2017), who also highlighted the association between education level and QoL. Previous studies also found that individuals with a higher education level have better perceived QoL, with significant differences in several dimensions (Ferreira & Anes, 2010). These findings can be explained by the fact that individuals with a higher education level have greater access to information, more intellectual resources, and a greater ability to adapt to kidney disease, its treatment, and its consequences.

The results show that the dimensions of Work status, Cognitive function, Physical role, Emotional well-being, Emotional functioning, Energy/fatigue, and General health perceptions had statistically significant negative correlations with age, with a small size effect, and Physical functioning, with a moderate size effect. These results align with those found by Nadeem et al. (2021) and Anes and Ferreira (2009) who showed that age influenced the

QoL of patients with CKD.

The analysis of the association between QoL and area of residence showed that statistically significant differences were found in the dimensions of Dialysis staff encouragement ($p = 0.010$) and Pain ($p = 0.042$), with the North region showing higher scores than the other regions. These results suggest that patients in the North region are more tolerant of pain and more encouraged by healthcare professionals to manage their disease. In a multicenter study with 271 participants, Zahid et al. (2021) also found evidence that the area of residence has an impact on the QoL of patients with CKD. This study showed that male participants had better QoL, particularly in the dimensions of Physical functioning, Pain, Emotional well-being, and Energy/fatigue. These results corroborate those found by Santos et al. (2014) and Anes and Ferreira (2009), namely in the dimensions of Symptoms/problems, Effects of kidney disease on daily life, Pain, Emotional functioning, and Vitality.

The main limitations of this study included the small sample size, the difficulty of adherence to the study, and the low internal consistency of some dimensions, which may have influenced the results. In addition, the sample used in this study was obtained in the various regions of Portugal. However, it did not include the Algarve region, which might limit the generalizability of the results to this region and other countries.

SF-36 scores were compared to the standard value for the general population to determine whether patients with CKD had the same QoL as the rest of the population. In all dimensions, statistically significant lower scores ($p < .001$) were obtained, revealing that patients with CKD have a lower QoL than the general population. This result was expected given the comorbidities associated with CKD and the fact that it mainly affects older people, which is a variable of lower QoL.

Conclusion

The highest scores were found in the dimensions of Dialysis staff encouragement (82.46) and Social support (77.49), while Work status (26.77) and Burden of kidney disease (29.2) had the lowest scores.

This study showed ($p < 0.001$) that patients with CKD undergoing regular hemodialysis have lower scores in all SF-36 domains than the general Portuguese population, which reflects the decrease in the QoL of these patients. It also concluded that the area of residence influenced QoL in the domains of Pain ($p = .0042$) and Dialysis staff encouragement ($p = 0.010$), with the North region scoring higher than the other regions. Moreover, male patients had statistically significant higher scores in the domains of Physical functioning ($p = 0.023$), Pain ($p = 0.011$), Emotional well-being ($p = 0.020$), and Energy/fatigue ($p = .012$), suggesting that gender impacts these patients' QoL. This study also suggests that the area of residence influences patients' QoL in the dimensions of Work status ($p = 0.101$), Dialysis staff encouragement ($p = 0.010$), and Pain ($p = 0.042$), with the North region showing higher scores than the other regions. On the other hand, age was negatively associated with QoL in the dimensions of Work status ($p < 0.05$), Cognitive function, Physical role ($p < 0.05$), Emotional well-being ($p < 0.001$), Emotional functioning ($p < 0.001$), Energy/fatigue ($p < 0.001$), and General health perceptions ($p < 0.001$).

It also concluded that the duration of hemodialysis had a statistically significant negative association with the dimensions of Social support ($p < 0.05$), Patient satisfaction ($p < 0.05$), Pain ($p < 0.001$), Patient satisfaction ($p < 0.001$), and General health perceptions ($p < 0.001$). These results indicate a decrease in QoL in several dimensions in patients with CKD undergoing regular hemodialysis compared to the general Portuguese population, calling for the need to implement action plans to improve QoL.

Programs should be developed to improve health literacy and promote health education, given that patients with a higher education level had better QoL than the other patients. Examples include patient information, guidance, self-care training strategies, and easy-to-understand and accessible educational materials.

In addition, it is important to address each dimension of QoL individually and design specific strategies for each one. For example, programs aimed at improving physical fitness through appropriate exercises performed by health professionals may have a positive impact on the Physical functioning and Energy/fatigue of patients with CKD. Last but certainly not least, it is crucial to implement programs that offer emotional support to patients, such as psychosocial support groups and emotional support therapies, and promote emotional well-being through, for example, occupational therapy and relaxation practices. Longitudinal studies should be conducted with robust designs and probability samples to obtain more solid evidence and better understand this subject matter.

Author contributions

Conceptualization: Silva, A., Frazão, J., Pimenta, R.
Data curation: Silva, A., Pimenta, R.
Formal analysis: Silva, A., Pimenta, R.
Investigation: Silva, A.
Methodology: Silva, A., Frazão, J., Pimenta, R.
Project administration: Silva, A., Pimenta, R.
Visualization: Silva, A., Pimenta, R.
Writing - original draft: Silva, A.
Writing - review and editing: Silva, A., Frazão, J., Pimenta, R.

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