de Sousa-Silva EC, et al. https://doi.org/10.37551/S2254-28842024003

# Health-related quality of life and its association with financial toxicity in haemodialysis treatment

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**Please cite this article in press as:**
de Sousa-Silva EC, de Fátima-Mantovani M, da Silva-Pires CG, Giovani-Paes R, Puchalski-Kalinke L, de Alcantara-Nogueira L. Health-related quality of life and its association with financial toxicity in haemodialysis treatment. Enferm Nefrol. 2024;27(1):21-7

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Reception: 05-06-23
Acceptance: 22-01-24
Publication: 30-03-24

## ABSTRACT

**Introduction:** Individuals with chronic kidney disease may experience reduced quality of life associated with treatment costs.

**Objective:** To evaluate health-related quality of life and its relationship with financial toxicity in individuals with chronic kidney disease undergoing hemodialysis treatment.

**Material and Method:** An observational, cross-sectional study involving 214 individuals was carried out, with data collected from February to May 2022 at four specialized dialysis clinics in the southern region of Brazil. Sociodemographic and clinical questionnaires, the Comprehensive Score for Financial Toxicity, and the Kidney Disease Quality of Life - Short Form were utilized. Descriptive analysis with absolute and relative frequencies was conducted for sociodemographic and clinical variables, and Pearson correlation was used for financial toxicity and health-related quality of life scores.

**Results:** Four items of the Kidney Disease Quality of Life-Short Form questionnaire had an average score below 50, indicating poor quality of life: "General health" (10.75), "Limitations in physical functioning" (29.93), "Burden of kidney disease" (37.76), and "Work status" (39.49), with physical (34.49) and mental (49.19) composite scores. The relationship between financial toxicity and health-related quality of life revealed that a worse financial toxicity score was associated with a greater number of impaired dimensions. There was a significant correlation between financial toxicity, the mental health dimension, and the effects of kidney disease.

**Conclusion:** Participants experienced compromised health-related quality of life, with a positive correlation with financial toxicity.

**Keywords:** quality of life; chronic kidney disease; financial stress.

## RESUMO

### A qualidade de vida e a relação com a toxicidade financeira no tratamento hemodialítico

**Introdução:** Pessoas com doença renal crônica podem ter redução da qualidade de vida associada aos custos do tratamento.

**Objetivo:** Avaliar a qualidade de vida relacionada a saúde e a relação com a toxicidade financeira de pessoas com doença renal crônica em tratamento hemodialítico.

**Material e Método:** Estudo observacional, descritivo e transversal realizado com 214 pessoas, cuja coleta de dados ocorreu de fevereiro a maio de 2022, em quatro clínicas especializadas em diálise na região sul do Brasil. Utilizou-se

os questionários sociodemográfico e clínico, Comprehesive Score for Financial Toxicity e o Kidney Disease Quality Of Life–Short Form. Os dados das variáveis da caracterização sociodemográfica e clínica, foram analisados descritivamente com frequências absolutas e relativas; para os escores da toxicidade financeira e qualidade de vida relacionada à saúde foi usado a correlação de Pearson.

**Resultados:** Quatro itens do questionário Kidney Disease Quality Of Life – Short Form tiveram média abaixo de 50, sendo consideradas com escore ruim de qualidade de vida, são eles: "Saúde geral" (10,75), "Limitações das funções físicas" (29,93), "Sobrecarga da doença renal" (37,76) e "Situação de trabalho" (39,49), e compostos físico (34,49) e mental (49,19). A relação da toxicidade financeira e a qualidade de vida relacionada à saúde, evidenciou que um pior escore de toxicidade financeira foi associado à maior número de dimensões prejudicadas. Houve correlação significativa entre a toxicidade financeira e a dimensão saúde mental e a efeitos da doença renal.

**Conclusão:** Os participantes tiveram comprometimento da qualidade de vida relacionada à saúde, havendo correlação positiva com a toxicidade financeira.

**Palavras-chave:** Qualidade de vida; insuficiência renal crônica; estresse financeiro.

## RESUMEN

### Calidad de vida y relación con la toxicidad financiera en el tratamiento en hemodiálisis

**Introdución:** Las personas con enfermedad renal crónica pueden tener una calidad de vida reducida asociada a los costes del tratamiento.

**Objetivo:** Evaluar la calidad de vida relacionada con la salud y la relación con la toxicidad financiera en personas con enfermedad renal crónica sometidas a tratamiento de hemodiálisis.

**Material y Método:** Estudio observacional, descriptivo y transversal de 214 personas, con datos recogidos entre febrero y mayo de 2022 en cuatro clínicas especializadas en diálisis del sur de Brasil. Fueron utilizados los cuestionarios sociodemográfico y clínico, el COmprehesive Score for Financial Toxicity y el Kidney Disease Quality Of Life - Short Form. Los datos de las variables sociodemográficas y clínicas se analizaron descriptivamente con frecuencias absolutas y relativas; se utilizó la correlación de Pearson para las puntuaciones de toxicidad financiera y calidad de vida relacionada con la salud.

**Resultados:** Cuatro ítems del cuestionario Kidney Disease Quality Of Life - Short Form obtuvieron una puntuación media inferior a 50, y se consideró que tenían una mala calidad de vida, a saber: "Salud general" (10,75), "Limitaciones de las funciones físicas" (29,93), "Carga de la enfermedad renal" (37,76) y "Situación laboral" (39,49), y compuestos: físico (34,49) y mental (49,19). La relación entre la toxicidad financiera y la calidad de vida relacionada con la salud mostró que una peor puntuación de toxicidad financiera se asociaba con un mayor número de dimensiones deterioradas. Existía una correlación significativa entre la toxicidad financiera y la dimensión de salud mental y los efectos de la enfermedad renal.

**Conclusión:** La calidad de vida relacionada con la salud de los participantes se vio comprometida y hubo una correlación positiva con la toxicidad financiera.

**Keywords:** calidad de vida; insuficiencia renal crónica; estrés financiero.

## INTRODUCTION

Health-related quality of life (HRQoL) reflects the impact of disease or its treatment on patients' subjective perceptions of their physical, mental, spiritual, emotional, social, and functional well-being. HRQoL assessment has been increasingly used and is regarded as an important measure in individuals receiving renal replacement therapy (RRT), since the aim of treatment—beyond improving survival—is to achieve a better quality of life[1,2].

A study conducted in India[3] among patients on haemodialysis showed that participants and their carers valued leisure moments—such as the possibility of travelling and time free from dialysis—demonstrating the relevance of good quality of life. That study also highlighted the importance of financial resources to support such periods, as participants with lower income showed worse scores in the mental health, burden, and effects of disease subscales of quality-of-life assessment[3].

Low income as a detrimental factor for HRQoL was also identified in a Brazilian study[4] that evaluated HRQoL in patients with chronic kidney disease (CKD) undergoing haemodialysis. Two-thirds of participants reported an income equal to or less than one minimum wage, and this factor was associated with poorer HRQoL. Results further indicated that one of the main drivers of income reduction after diagnosis is withdrawal from paid employment imposed by CKD and haemodialysis treatment.

In Australia[5], a study quantifying the financial impact and expenses of rural adults with CKD showed that 78% of families struggled to afford treatment, with 54% reporting financial catastrophe—emphasising finance as an additional source of concern.

Although in Brazil patients with CKD on haemodialysis are treated in specialised, free, public services, there are still costs associated with self-care, such as maintaining a restricted diet and travelling to the dialysis unit. These expenses, coupled with potential job loss and decreased household income, may negatively influence HRQoL[6] and reflect an adverse event of costly disease known as financial toxicity.

Financial toxicity is a harmful impact experienced by patients unable to meet treatment costs or bear extra expenses inherent to their condition. The term encompasses both direct health-related costs and other financial issues that may affect treatment, creating barriers to necessary medical care[7]. Research on financial toxicity in CKD remains incipient.

Several studies have linked financial toxicity to worse HRQoL[8-10], as patients, in an effort to save money, may not adhere to prescribed treatments, forego important procedures, and consequently experience clinical deterioration[11,12]. Thus, the objective of this study was to assess health-related quality of life and its relationship with financial toxicity in individuals with chronic kidney disease undergoing haemodialysis.

## MATERIAL AND METHOD

We conducted a quantitative, observational, descriptive, cross-sectional study derived from a Master's dissertation at the Federal University of Paraná. Data were collected between February and May 2022 in four dialysis clinics accredited to the Unified Health System (SUS) in Curitiba, Paraná, and its metropolitan region. These clinics are regional referral centres for RRT, operating since the early 1980s, and provide services in nephrology, haemodialysis, peritoneal dialysis, kidney transplantation, nutrition, and hypertension.

Sample size was calculated by a statistician using Epi Info 7 software, based on the total number of patients treated in the units (Instituto do Rim do Paraná, n=156; Clínica de Doenças Renais São José dos Pinhais, n=173; Unidade Renal do Portão, n=151; Clínica de Doenças Renais Colombo, n=117; total=597). Assuming an expected frequency of 50% for the outcome of interest (the most conservative scenario), a 5% margin of error, and a 95% confidence level, the sample was stratified, with voluntary participation.

Recruitment was by convenience sampling; all eligible patients present at the time of data collection were invited. Inclusion criteria were diagnosis of CKD and haemodialysis treatment, age ≥18 years. Patients with communication disorders and/or documented mental illness were excluded.

Data collection instruments included a sociodemographic and clinical form, the Comprehensive Score for Financial Toxicity (COST) questionnaire, and the Kidney Disease Quality of Life Short Form (KDQOL-SF™ 1.6).

The COST questionnaire, developed by the US Functional Assessment of Chronic Illness Therapy (FACIT) group, assesses financial toxicity through 12 items. Responses use a 5-point Likert scale (0=not at all to 4=very much), yielding a total score of 0–44, where higher scores indicate better financial well-being and lower toxicity.

The KDQOL-SF™ 1.6 evaluates HRQoL in CKD patients on dialysis. It includes eight SF-36 dimensions—physical functioning (10 items), role-physical (four), role-emotional (three), social functioning (two), mental health (five), pain (two), vitality (four), general health perceptions (five), and health transition (one). These SF-36 items can be summarised into physical and mental composite scores[13-14].

In addition, KDQOL-SF™ 1.6 has 11 kidney-specific dimensions (eg, symptoms, effects of kidney disease, burden of kidney disease, work status, cognitive function, social interaction, sexual function, and sleep) and three additional scales (social support, dialysis staff encouragement, patient satisfaction)[13-14]. Scores range from 0 (worst HRQoL) to 100 (best). Dimensions are analysed separately, providing domain-specific insights rather than a single global score. Poor HRQoL was defined as scores <50[15].

Clinical data were analysed using descriptive statistics, with the number of individuals per characteristic and their respective proportions recorded. For calculation of scores from the KDQOL-SF™ 1.3 instrument, the analysis spreadsheet provided by the KDQOL-SF Working Group on the RAND Corporation research website was used.

To assess the correlation between financial toxicity scores obtained from the COST instrument and HRQoL scores from the KDQOL-SF™ 1.3, Pearson's correlation was applied. A statistically significant positive correlation was considered when $p<0.0001$.

The study was approved by the Human Research Ethics Committee of the Health Sciences Sector, Federal University of Paraná (approval no. 5.210.448).

## RESULTS

The sample included 214 individuals with CKD undergoing haemodialysis. Of these, 117 were men, most had < 9 years of schooling, and 122 were retired or pensioners. A total of 128 reported receiving haemodialysis for 1–5 years, and 203 underwent treatment three times per week. Regarding education, 166 participants had <12 years of formal schooling.

Concerning lifestyle habits, 9 participants reported current smoking, 58 were former smokers, and 127 were non-smokers. Only 9 reported moderate or higher alcohol consumption.

With regard to participants' HRQoL, according to the results presented in **table 2**, analysis of the mean scores of the KDQOL-SF™ 1.3 questionnaire dimensions showed that the lowest means, in ascending order, were: "General health" (10.75), "Physical role limitations" (29.93), "Burden of kidney disease" (37.76), and "Work status" (39.49).

Conversely, the highest scores were seen for cognitive function (87.89), sexual function (87.14), social support (84.19), and dialysis staff encouragement (83.35). Notably, the sexual function domain was completed by only 35 participants. Six

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Table 1. Characterisation of the sample according to clinical variables. Curitiba, PR, Brazil, 2022.

| Variables | n=214 | % |
|---|---|---|
| **Family history of CKD** | | |
| No | 186 | 86.92 |
| Yes | 26 | 12.26 |
| Not reported | 2 | 0.93 |
| **Time since CKD diagnosis (years)** | | |
| < 1 | 23 | 10.75 |
| 1–5 | 102 | 47.66 |
| 6–10 | 45 | 21.03 |
| > 10 | 44 | 20.56 |
| **Time on haemodialysis (years)** | | |
| < 1 | 37 | 17.29 |
| 1–5 | 127 | 59.35 |
| 6–10 | 22 | 10.28 |
| > 10 | 26 | 12.15 |
| Not reported | 2 | 3.45 |
| **Number of haemodialysis sessions per week** | | |
| Twice | 3 | 1.40 |
| Three times | 203 | 94.86 |
| More than three times | 8 | 11.11 |
| **Use of continuous medication** | | |
| Yes | 188 | 88.26 |
| No | 25 | 11.68 |
| Not reported | 1 | 0.47 |

**Source:** The author (2022).
**Legend: (n):** absolute number; **(%):** percentage; **(<):** less than; **(>):** greater than.

Tabla 2. Distribution of means and standard deviations of the dimensions of the Health-Related Quality of Life questionnaire. Curitiba, PR, Brazil, 2022.

| Scale | n | Mean | SD |
|---|---|---|---|
| Burden of kidney disease | 214 | 37.76 | 29.24 |
| Quality of social interaction | 213 | 80.03 | 18.58 |
| Cognitive function | 213 | 87.89 | 15.58 |
| Symptoms/problems list | 205 | 81.74 | 14.77 |
| Effects of kidney disease | 180 | 64.22 | 20.26 |
| Sexual function | 35 | 87.14 | 17.80 |
| Sleep | 210 | 68.92 | 20.40 |
| Social support | 214 | 84.19 | 24.40 |
| Work status | 214 | 39.49 | 26.88 |
| Encouragement from dialysis staff | 214 | 83.35 | 25.89 |
| General health | 214 | 10.75 | 31.04 |
| Patient satisfaction | 214 | 68.22 | 46.67 |
| Physical functioning | 210 | 42.50 | 30.84 |
| Physical role limitations | 213 | 29.93 | 41.34 |
| Pain | 212 | 69.99 | 27.90 |
| Emotional well-being | 211 | 72.32 | 20.28 |
| Emotional role limitations | 211 | 53.87 | 45.07 |
| Social functioning | 210 | 69.52 | 27.23 |
| Energy/fatigue | 210 | 41.73 | 17.32 |
| SF-12 Physical Component Summary | 208 | 34.49 | 10.46 |
| SF-12 Mental Component Summary | 208 | 49.19 | 11.14 |

**Source:** The author (2022).
**Legend: (n):** absolute number; **(SD):** standard deviation.

domains had mean scores <50, consistent with poor HRQoL. Both the physical composite (34.49) and the mental composite (49.19) scores were also <50, indicating impaired HRQoL.

In correlation analysis, the mental health composite strongly correlated with emotional well-being (R=0.82, p<0.0001) and emotional role limitations (R=0.83, p<0.0001). Similarly, the physical composite strongly correlated with physical well-being (R=0.78, p<0.0001) and physical role limitations (R=0.74, p<0.0001) **(figure 1)**.

Work status strongly correlated with satisfaction (R=0.82, p < 0.0001). Social support and sexual function showed a moderate positive correlation (R=0.62, p<0.0001). Sexual function also positively correlated with sleep (R=0.79, p<0.0001) and symptoms/problems (R=0.79, p<0.0001).

## DISCUSSION

This study evaluated HRQoL and its relationship with financial toxicity in individuals with chronic kidney disease (CKD) undergoing haemodialysis in four renal care units in Curitiba and the surrounding metropolitan region.

Regarding sociodemographic data, the results were similar to those of another Brazilian study[16] conducted in Santa Catarina with patients on haemodialysis, which found a predominance of men (52.8%), age range 20–86 years (41.42% aged 40–59 years and 39.99% aged ≥60 years), 52.85% married, with most participants having low educational attainment and being retired.

A similar profile was also found in a study carried out in Paraná, in which most individuals analysed were male (54.87%), 26.15% were aged 61–70 years, 63.10% were married, and 63.58% had not completed primary education[17].

The most recent Brazilian dialysis centre censuses confirm the male predominance among patients, which may reflect unhealthy lifestyle habits, lower adherence to preventive health care, and reduced use of health services until morbidities are already advanced[18-19].

Evaluation of HRQoL in the present study revealed that many mean dimension scores were <50, classified as poor HRQoL. The most affected domains were General Health and Physical Functioning. Similar findings were reported in a study[20] from Mato Grosso, Brazil, which found the lowest mean score in

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the physical aspects domain (44.16). Similarly, a study in Ponta Grossa, Paraná,[21] found that Cognitive Function (6.2) and Physical Role Limitations (49.5) were the lowest-scoring domains.

Another study in northwest Paraná[22] with patients with CKD aged ≥18 years reported the lowest mean score in the Physical Performance domain (33.67), with a median score of 0.

Collectively, these studies demonstrate that the physical dimension is one of the most impaired in this population. Low scores in physical performance reflect limitations that hinder daily activities, affect the ability to perform previous tasks, and reduce the likelihood of maintaining active employment[22].

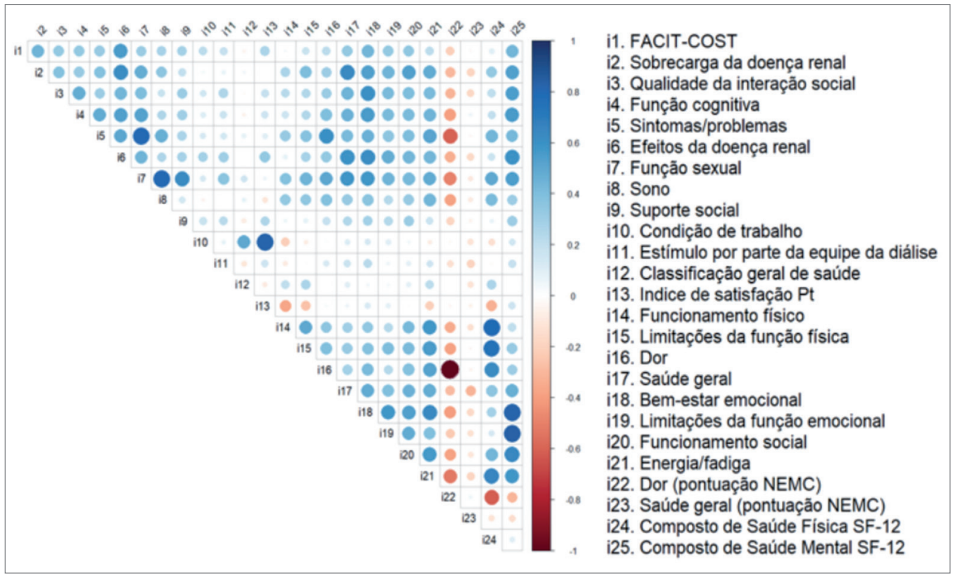


**Figure 1.** Correlation matrix between the COST instrument and the KDQOL-SFTM 1.3 Curitiba, PR, Brazil, 2022.

Supporting this, an Indian study[3] investigating the correlation between HRQoL and socioeconomic and clinical variables in CKD found that poorer HRQoL was associated with adverse outcomes such as increased cardiovascular risk and mortality. The study also emphasised the need for a more inclusive approach to CKD management, incorporating social determinants to strengthen patient care.

In the present study, Work Status also scored poorly. This may reflect the difficulty of maintaining employment after CKD diagnosis and initiation of haemodialysis due to the time required for treatment and its impact on work activities. Similar findings were reported in Uberaba, Brazil, where Work Status (8.82%) and Physical Limitations (26.47%) were the most affected domains[23].

When the relationship between COST and HRQoL was examined, greater financial toxicity was associated with poorer HRQoL. Comparable findings were reported in a US study[24] in patients with cancer, where less financial toxicity was associated with better HRQoL.

In this study, a significant correlation was observed between financial toxicity and mental health: higher COST scores (indicating less toxicity) correlated with higher mental health composite scores. A US study[24] likewise found a significant Pearson correlation between COST and mental well-being ($r=0.45$; $p<0.0001$). This highlights the need for nursing care to extend beyond physical aspects and address socioeconomic issues.

According to these data, financial toxicity may be correlated with worsening mental health, as evidenced by one study[25] which showed that any degree of financial toxicity was associated with poorer outcomes in both the mental and physical dimensions. Furthermore, compared with individuals without financial toxicity, those with some level of toxicity had lower scores in both the physical and mental components.

In this study, an association was observed between financial toxicity and the impacts of kidney disease. This relationship was demonstrated through the strength of associations between financial toxicity and pain interference ($r=-0.27$), financial toxicity and physical functioning ($r=-0.32$), and financial toxicity and social functioning ($r=-0.31$), all of which were considered moderately strong and statistically significant. Therefore, although financial toxicity is a relatively new concept, studies already highlight the importance of nurses assessing it due to the impact it has on HRQoL.

Beyond drawing attention to the impact of CKD and haemodialysis on HRQoL in this population, it is also crucial to recognise the presence of financial toxicity, which, when combined with the disease and its treatment, can further worsen HRQoL. Thus, the results of this study point to the need for health professionals to understand the impact of financial toxicity on both HRQoL and the financial well-being of individuals with CKD, with the aim of promoting and encouraging interventions to mitigate this effect and thereby improve HRQoL.

The limitations of this study were related to the scarcity of published studies using the COST tool and HRQoL instruments in kidney disease, participants' discomfort in answering the sexuality-related question, and the use of Pearson's correlation coefficient, which assumes normality of data.

Based on the results obtained, it can be affirmed that participants experienced impaired HRQoL, with a positive corre-

lation observed with financial toxicity. Specifically, poorer COST scores were associated with a greater number of impaired HRQoL dimensions. Significant correlations were found between financial toxicity and both the Mental Health domain and the Effects of Kidney Disease domain.

To our knowledge, this is one of the first studies to apply the COST instrument, recently translated into Brazilian Portuguese, in a population with CKD undergoing haemodialysis. The findings suggest that this population experiences levels of financial toxicity that are negatively associated with HRQoL, a relationship that warrants further exploration in studies comparing the impact of CKD across different services and population groups.

The contributions to nursing practice include the need to encourage professionals to measure quality of life and financial toxicity, to incorporate these topics into nursing education, and to provide tools that support interventions aimed at minimising the harm caused by these variables in patients with CKD and other chronic conditions. In addition, establishing support networks for these patients from the point of diagnosis is essential.

## Acknowledgements

We thank the health clinics for granting access to conduct this study, the entire nursing staff for their support during data collection, and especially all the individuals who agreed to participate. We also acknowledge the National Council for Scientific and Technological Development (CNPq) for the productivity fellowships awarded to two of the authors.

## Conflicts of interest

None declared.

## Funding

No specific funding was received for this study. Two authors are productivity fellows of the Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq).

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