Quality of life as a predictor of hospitalization in patients with chronic kidney disease on hemodialysis: a retrospective cohort study

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ABSTRACT

Introduction: As medical advances are achieved in the care of chronically ill patients, there is increasing evidence that health-related quality of life (QoL) is associated with poor outcomes, including hospitalization and death. This study aimed to evaluate QoL as a predictor of hospitalization and death in patients with chronic kidney disease (CKD) on hemodialysis.

Methods: A retrospective cohort study of 108 patients with CKD on hemodialysis with 24-month follow-up. QoL was assessed by the Kidney Disease Quality of Life Short-Form (KDQOL-SF), including time to first hospitalization and death as outcomes.

Results: The highest KDQOL-SF scores at baseline were observed in Sexual function, Dialysis staff encouragement, and Cognitive function, while the lowest scores were observed in Working status, Role physical, and Energy/fatigue. There was an association of Overall health and Role emotional domains with shorter time to first hospitalization. Data analyzed were insufficient to indicate an association of QoL with mortality in this population.

Conclusion: QoL was associated with time to first hospitalization in patients with CKD on hemodialysis, but the results were not sufficient to indicate its association with mortality.

Keywords: Chronic kidney failure; renal dialysis; quality of life; survival analysis

Advances in medical care have extended not only the life expectancy but also the burden of illness and treatment of chronically ill patients, including those with chronic kidney disease (CKD). It is therefore increasingly important that health care providers pay close attention to patients' individual perceptions of their health, fitness, life satisfaction, and well-being[1].

CKD is a global health burden that imposes high economic costs on health systems and has been considered an important and independent risk factor for cardiovascular disease[2]. Advanced CKD is characterized by irreversible renal injury that interferes directly with the normal hormonal, regulatory, and excretory functions of the kidneys. At this stage, renal replacement therapy with dialysis and/or kidney transplantation are required[3]. CKD has a consistent estimated global prevalence of 11%-13%, with most cases classified as stage III[2].

Hemodialysis, by replacing some missing functions of the kidney, also induces changes in other organs, including the neuromuscular, bone, cardiovascular, endocrine, immune, and respiratory systems[4]. Patients usually have symptoms such as fatigue[5], generalized muscle weakness[6], low exercise tolerance[4], erectile dysfunction[7], decreased libido[8], and reduced oxygen consumption[9]. These changes result in functional impairment, decreased work capacity, and dependence for activities of daily living[4,8,10,11].

CKD affects patients not only physically but also mentally, with patients reporting depressive symptoms[12-14] that affect their mental and emotional health, with consequences to the general well-being and social behavior of individuals[8]. Depression has been associated with poor health-related quality of life (QoL) and negative outcomes, including worse morbidity and mortality in this population[13,14].

QoL is a subjective perception of well-being that can be assessed by measuring symptoms, satisfaction, and treatment adherence[11], and is based on the difference between patients' health expectations and experiences[10,15-17]. QoL in patients with chronic diseases has long been assessed solely in terms of survival and signs of the presence of the disease, without considering psychosocial and therapeutic implications[11,18].

Specific instruments are used to assess certain aspects of QoL in populations with a specific disease, such as heart failure[19], osteoarthritis[20], and chronic obstructive pulmonary disease[21]. The Kidney Disease Quality of Life-Short Form (KDQOL-SF), a questionnaire that assesses particular health-related concerns of individuals with kidney disease by means of disease-targeted items, was translated and validated for use in the Brazilian population[18]. This is an easily applied tool with reliable psychometric properties that can be used routinely in clinical practice[18].

QoL assessment has been used for monitoring the efficiency of hemodialysis[22] and as a predictor of death[17,23], hospitalization[17,24], and progression of CKD to end stage[23]. A study conducted in the United States, European countries, and Japan involving patients with CKD on hemodialysis showed that low KDQOL-SF scores in physical, mental, and specific components of kidney disease are associated with increased risk of death and hospitalization in this population[17]. Determining reliable prognostic factors for mortality and morbidity is of great relevance in the clinical follow-up of these patients[24]. In Brazil, however, there is a lack of studies addressing QoL as an indicator of mortality and morbidity in patients with CKD. Therefore, the purpose of the present study was to evaluate QoL as a predictor of hospitalization and death in patients with CKD on hemodialysis with a follow-up of 24 months.

METHODS

This retrospective cohort study was approved by the Research Ethics Committee of Irmandade Santa Casa de Misericórdia de Porto Alegre (ISCMPA) (approval number 3453/10), Universidade Federal de Ciências da Saúde de Porto Alegre (UFCSPA) (approval number 551/10), and the Brazilian Clinical Trials Registry (registration number RBR-25TCRT). The sample consisted of patients with CKD on hemodialysis who were followed from January 2011 to December 2012. All participants provided written informed consent prior to inclusion in the study. Eligible participants were all patients aged ≥ 18 years undergoing treatment for at least 3 months with 3 weekly sessions at the Outpatient Hemodialysis Unit of ISCMPA Santa Clara Polyclinic. Patients were selected by convenience sampling through oral invitation, regardless of ethnicity, sex, and level of education. Patients who were cognitively impaired and/or unable to answer the questionnaire were excluded from the study.

KDQOL-SF scores were analyzed in association with time to first hospitalization and survival time.

Application of the KDQOL-SF

The KDQOL-SF was applied by trained interviewers before the hemodialysis session for 2 consecutive years. The KDQOL-SF includes the SF-36 and 43 CKD-targeted items. The SF-36 consists of 36 items divided into 8 domains: Physical functioning, Role limitations caused by physical health problems, Role limitations caused by emotional health problems, Social functioning, Mental health, Pain, Vitality (Energy/fatigue), and Perceptions of general health and current health status compared to 1 year ago. CKD-targeted items are divided into 11 domains: Symptoms/problems, Effects of kidney disease on daily life, Burden of kidney disease, Working status, Cognitive function, Quality of social interaction, Sexual function, and Sleep. It also includes 3 additional QoL scales (Social support, Dialysis staff encouragement, and Patient satisfaction) and a final item to rate overall health on a 0-10 scale. The scores were calculated following the scoring procedure provided by the questionnaire for each domain, ranging from 0 to 100, with higher scores indicating better QoL[18].

Biochemical evaluation

Biochemical data were collected monthly as part of the hemodialysis unit routine. The data were then collected from the patients' electronic medical records according to the date corresponding to the QoL assessment and inclusion in the study and were used for sample characterization. All laboratory tests were performed at ISCMPA Central Laboratory.

Evaluation of mortality and morbidity

Data on survival time (mortality) and time to first hospitalization (morbidity) during follow-up were collected retrospectively from the patients' electronic medical records at ISCMPA Santa Clara Hospital or via a telephone contact protocol.

Statistical analysis

Descriptive variables were expressed as mean (standard deviation) or median (interquartile range),

while categorical variables were expressed as absolute and relative frequencies. The Shapiro-Wilk test was used to determine the normality of data distribution. Spearman's correlation coefficients were calculated to test the correlation between KDQOL-SF domain scores and hospitalization days. The relationship between predictors (KDQOL-SF domain scores) and outcomes (survival time and time to first hospitalization) was assessed through survival curves estimated by the Kaplan-Meier method. The sample was divided based on the median of KDQOL-SF domain scores by the log-rank (Mantel-Cox) test. An odds ratio (OR) analysis was performed to estimate the relative risk of predictors on outcomes. Data were analyzed using SPSS, version 19.0, and a p-value < 0.05 was considered statistically significant.

RESULTS

Of 166 patients with CKD on hemodialysis in 2011, 108 were included in the study. Of these, 83 were followed up to 2012 and analyzed in this study. Figure 1 shows a flow chart of patient follow-up, including losses and exclusions during follow-up.

The clinical and biochemical characteristics of the sample at study entry are shown in Table 1.
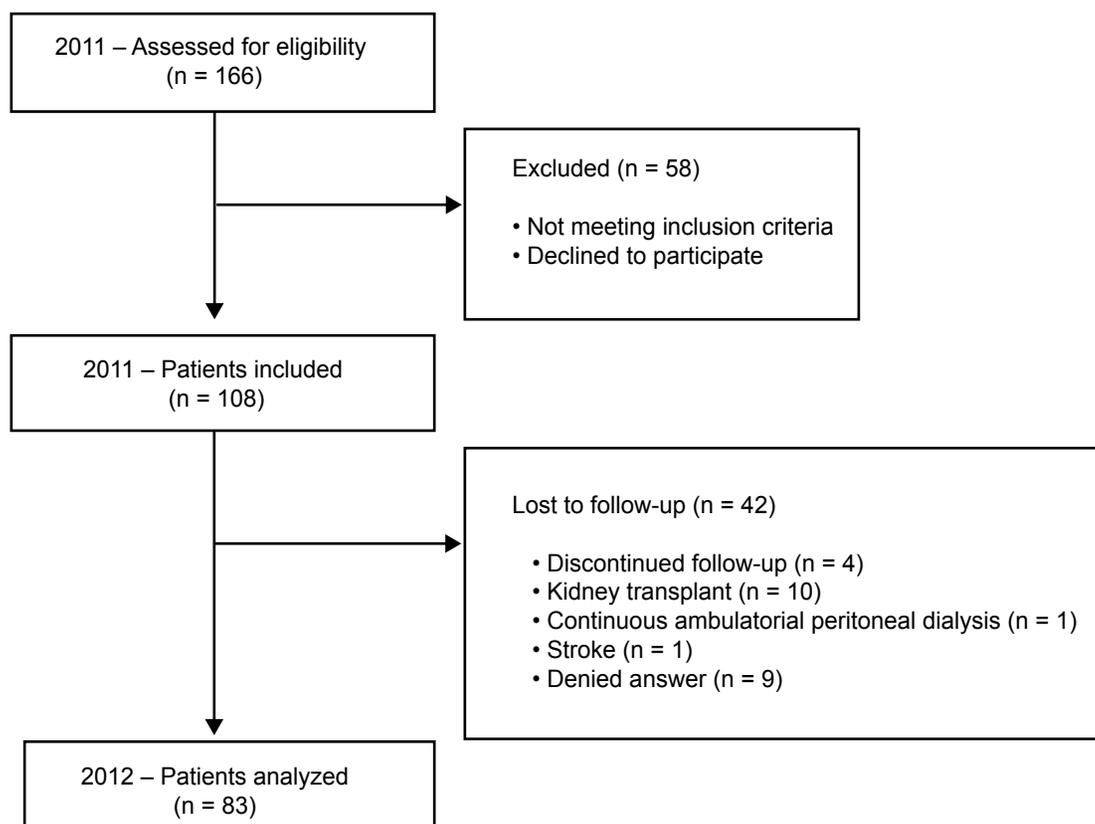

Figure 1: Flow chart of patient follow-up with losses and exclusions during follow-up.

During the 24-month follow-up period, 12 (11.1%) patients died due to CKD complications, 5 (4.6%) were admitted for CKD complications, and 10 (9.2%) underwent a kidney transplant. Hospitalization time was 20 (12-29) days at baseline.

The highest KDQOL-SF scores at baseline were observed in the Sexual function (93.75 [75-100]), Dialysis staff encouragement (87.5 [62.5-100]), and Cognitive function (86.67 [80-100]) domains, while the lowest scores were observed in the Working status (25 [0-50]), Role physical (50 [0-75]), and Energy/fatigue (57.5 [33.75-75]) domains. No correlation was found between KDQOL-SF domain scores and hospitalization days.

Figure 2 shows Kaplan-Meier survival curves for time to first hospitalization and survival time during the 24-month follow-up period. There was a significant difference in the estimated time to first hospitalization between patients with values above and below the median scores in Overall health (11 × 6 months, p = 0.04) and Role emotional (11 × 8 months, p = 0.007).

Table 1: Clinical and biochemical characteristics of patients with CKD at study entry (n = 108).

Male/Female (%)	60/40
Age (years)	54.8 ± 15.1
Dialysis time (months)	60 [36-102]
Creatinine (mg/dL)	9.8 [7.45-11.6]
Pre-dialysis urea (mg/dL)	154.6 ± 45.8
Glucose (mg/dL)	95 [82-111]
Cholesterol (mg/dL)	148.2 ± 37.2
Triglycerides (mg/dL)	140 [91-179.5]

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Table 1: Continuation

Male/Female (%)	60/40
Hemoglobin (g/dL)	11.2 ± 2.1
Erythrocytes (millions/µL)	3.85 ± 1.2
Glutamic oxaloacetic transaminase (u/L)	18.5 [16-26]
Glutamic pyruvic transaminase (u/L)	16 [11-21]
Parathyroid hormone (pg/mL)	444.9 [193.4-881.3]

CKD = chronic kidney disease.
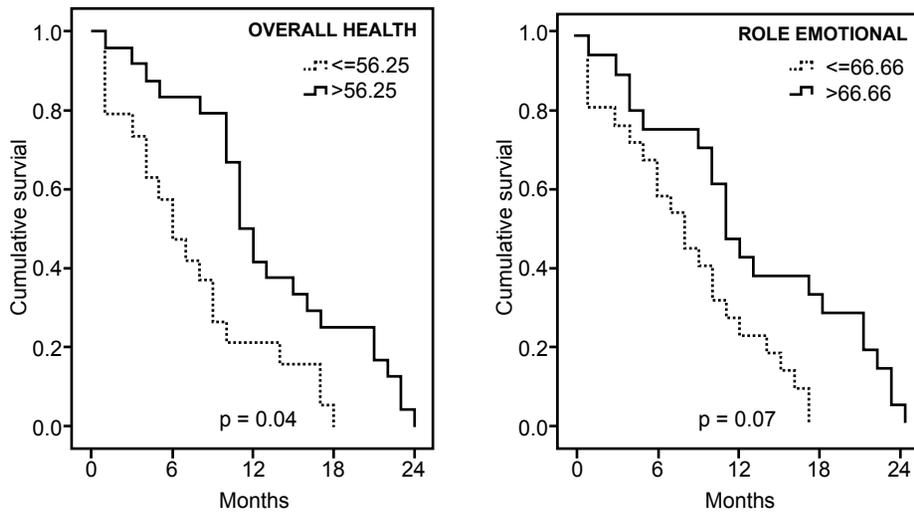Data are expressed as mean ± standard deviation or median and interquartile range (25th-75th).

Figure 2: Kaplan-Meier survival curves until first hospitalization during the 24-month follow-up period. Table 2 shows the median scores and 95% confidence intervals for all domains, in addition to the estimated time to first hospitalization (in days) and survival time (in months).

Table 2: Analysis of survival and hospitalization by the Kaplan-Meier method according to the median of KDQOL-SF domain scores by the log-rank (Mantel-Cox) test.

KDQOL-SF domain	Hospitalization					Survival		
	Median	95%CI	Estimate		p	95%CI	Estimate	P
Symptoms/ problems	≤ 82.81	7.7-12.2	10.0	0.552	0.552	9.3-18.6	14.0	0.192
	> 82.81	9.5-12.4	11.0			0.0-24.0	12.0	
Effects of kidney disease on daily life	< = 72.66	7.7-12.2	10.0	0.778	0.778	7.0-20.9	14.0	0.512
	> 72.66	8.8-13.1	11.0			3.6-20.3	12.0	
Burden of kidney disease	< = 50	5.8-12.1	9.0	0.217	0.217	13.6-22.3	18.0	0.009
	> 50	9.9-12.0	11.0			7.6-16.3	12.0	
Working status	< = 25	6.4-11.5	9.0	0.372	0.372	7.4-16.5	12.0	0.985
	> 25	9.7-12.2	11.0			3.2-26.7	15.0	
Cognitive function	< = 86.67	7.6- 12.3	10.0	0.760	0.760	7.9-22.0	15.0	0.297
	> 86.67	7.4-12.5	10.0			3.9-20.0	12.0	
Quality of social interaction	< = 85	6.4-13.5	10.0	0.751	0.751	4.8-15.1	10.0	0.149
	> 85	8.2-11.7	10.0			13.1-22.8	18.0	
Sexual function	< = 93.75	7.6-26.3	17.0	0.454	0.454	14.0-21.9	18.0	0.070
	> 93.75	10.1-11.8	11.0			3.5-16.4	10.0	

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Table 2: Continuation

KDQOL-SF domain	Hospitalization					Survival		
	Median	95%CI	Estimate		p	95%CI	Estimate	P
Sleep	< = 71.25	5.5-14.4	10.0	0.248	0.248	7.0-20.9	14.0	0.595
	> 71.25	8.1-11.8	10.0			4.6-19.3	12.0	
Social support	< = 83.33	7.3-12.6	10.0	0.908	0.908	7.6-16.3	12.0	0.289
	> 83.33	6.2-11.7	9.0			6.1-29.8	18.0	
Dialysis staff encouragement	< = 87.50	2.5-11.4	7.0	0.431	0.431	1.2-22.7	12.0	0.149
	> 87.50	9.4-12.5	11.0			11.7-24.2	18.0	
Patient satisfaction	< = 66.67	5.8-12.1	9.0	0.560	0.560	0.0-25.9	12.0	0.255
	> 66.67	8.8-13.1	11.0			10.3-17.6	14.0	
Physical functioning	< = 70	6.2-11.7	9.0	0.124	0.124	7.0-20.9	14.0	0.215
	> 70	9.9-12.0	11.0			3.6-20.3	12.0	
Role physical	< = 50	6.5-11.4	9.0	0.112	0.112	8.1-19.8	14.0	0.824
	> 50	9.6-12.3	11.0			7.3-22.6	15.0	
Pain	< = 63.13	5.7-14.2	10.0	0.857	0.857	8.6-19.3	14.0	0.062
	> 63.13	8.4-11.6	10.0			2.8-37.1	20.0	
Overall health	< = 56.25	3.1-8.8	6.0	0.04	0.04	8.8-19.1	14.0	0.640
	> 56.25	9.4-12.6	11.0			9.6-26.3	18.0	
Emotional well-being	< = 74	6.3-11.9	8.0	0.284	0.284	12.3-18.4	15.0	0.586
	> 74	9.2-14.9	11.0			7.9-17.4	12.0	
Role emotional	< = 66.66	4.5-11.4	8.0	0.007	0.007	8.5-21.4	15.0	0.793
	> 66.66	8.7-13.2	11.0			1.2-22.7	12.0	
Social functioning	< = 75	6.6-13.3	10.0	0.351	0.351	9.8-18.1	14.0	0.979
	> 75	8.1-11.8	10.0			0.9-23.0	12.0	
Energy/fatigue	< = 57.5	7.6-12.4	10.0	0.797	0.797	12.4-17.5	15.0	0.769
	> 57.5	10.0-11.9	11.0			9.0-14.9	12.0	

KDQOL-SF = Kidney Disease Quality of Life-Short Form; 95% CI = 95% confidence interval; $p < 0.05$.

DISCUSSION

The present study demonstrated that QoL can predict adverse outcomes, such as hospitalization. Among patients with CKD on hemodialysis, lower scores in KDQOL-SF Overall health and Role emotional domains were associated with shorter time to first hospitalization. As for survival time, despite a possible trend toward shorter survival with lower scores in the Pain domain, the data analyzed were insufficient to prove the indication of QoL as a predictor of mortality in this population.

In a previous study using the KDQOL-SF, lower scores in the 3 major components of the questionnaire (physical, mental, and specific components of kidney disease) were associated with higher risk of death and hospitalization in patients on hemodialysis[17]. Physical-related questionnaire domains have shown greater influence on mortality rates[17,25], in addition to a strong association with progression to end-stage renal disease[23]. Therefore, the KDQOL-SF is an important tool because it includes specific aspects of kidney disease, making it more sensitive in detecting possible changes in patients' health status[18,26] as well as a reliable instrument to measure QoL in patients on hemodialysis[27].

Our findings are consistent with an earlier study conducted in Brazil reporting that lower scores in the Overall health domain seem to be related to patients on hemodialysis feeling sick all the time, mostly because of nutritional restrictions, medications, and vascular access care[27]. Lower scores in KDQOL-SF domains have also been related to an increased number of associated diseases and time spent on hemodialysis[28]. An association has also been observed between lower QoL in patients with CKD and sociodemographic and clinical factors, such as higher consumption of medicines, more frequent hospitalizations, and a larger number of associated chronic diseases[17,25,28]. Subjective measures, such as questionnaire application, are associated with the physical condition of patients with CKD and

may represent, at least in part, the low physical and functional performance of these patients[29].

A cohort study with a follow-up of 12 months and QoL assessment by the SF-36 showed a correlation between hospitalization days and Physical functioning, Overall health, and Vitality, but no significant difference was found in survival curves[24]. In our study, although KDQOL-SF domain scores did not correlate with hospitalization days, they were able to demonstrate the influence of QoL domains on morbidity in the study population. Therefore, QoL assessment should be included in health care intervention programs for patients with kidney disease by using validated, disease-specific instruments in this population, such as the KDQOL-SF.

The survival of patients with CKD on hemodialysis is influenced by the presence of diabetes and older age at the start of the dialysis program, without direct influence of sex or ethnicity[30]. The mortality rate in our study was 16%, more significant than that of a previous study (12% in 12 months)[24], a result that is primarily related to the follow-up period of 24 months used in our study. A 25-year retrospective cohort study reported a mortality rate of 32.5%, which is significantly higher than that observed in our study probably because of a longer follow-up and larger sample[30]. It is worth noting that, in our study, 11% of patients underwent a kidney transplant, in contrast to only 1.8% in the above-mentioned 12-month follow-up study[24], which may partly be explained by the fact that data from our institution, ISCMPA, serve as a reference for the annual number of transplants performed in the country.

The present study has some limitations, such as the short follow-up period and the fact that data on mortality and hospitalization were collected retrospectively from medical records and by telephone contact. Further prospective studies are warranted to confirm our findings. In addition, variables known to be associated with mortality in patients with CKD were not included in the statistical analysis, such as age, diagnosis of diabetes mellitus, dialysis efficacy (Kt/v or URR), hyperphosphatemia, anemia, and Charlson comorbidity index. Also, multiple logistic regression models and potential confounders were not explored, preventing us from determining predictive effects on hospitalization and mortality with the use of QoL assessment.

QoL assessed by the KDQOL-SF is an important tool for monitoring patients and dialysis treatment. The results suggest that QoL measures can be used to identify patients potentially at risk for negative outcomes. It is also important to assess whether interventions that improve QoL also decrease the risk of death and hospitalization among patients on hemodialysis.

Acknowledgments

Conflicts of interest

The authors declare no conflicts of interest.

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