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Quality of life across chronic kidney disease stages and hemodialysis: association with regular physical activity

Abstract

Background and objectives: Chronic kidney disease (CKD) impairs health-related quality of life (HRQoL). Differences in HRQoL across treatment modalities and the role of physical activity remain incompletely understood. This study compared HRQoL between patients receiving conservative treatment and those undergoing maintenance hemodialysis (HD) and examined its association with regular physical activity.

Methods: This cross-sectional observational study included 126 adults with CKD from a single center in Porto Alegre, Brazil: 63 receiving conservative treatment and 63 receiving HD. HRQoL was assessed using the Brazilian Portuguese version of the Short Form-36 (SF-36) questionnaire. Regular physical activity was self-reported as performing at least 150 minutes per week. Group comparisons used appropriate parametric or nonparametric tests. Multiple linear regression models were adjusted for treatment group, age, and cancer.

Results: SF-36 scores did not differ significantly by treatment group or CKD stage. In adjusted regression models, treatment group was not significantly associated with any SF-36 domain. Age was associated with lower Physical Functioning scores (B = −0.673; 95% CI −1.061 to −0.285; p = 0.001). Among patients receiving HD, physically active participants had higher scores in Physical Functioning, Role-Physical, Bodily Pain, Vitality, and Role-Emotional. Among non-dialysis patients, physical activity was associated with higher Physical Functioning, Vitality, and Role-Emotional scores.

Conclusion: In this sample, HRQoL did not differ significantly according to treatment modality or CKD stage. Self-reported regular physical activity was associated with higher scores in selected SF-36 domains in both treatment groups. Given the cross-sectional design, these findings should not be interpreted as causal.

Keywords: chronic kidney disease, conservative, hemodialysis, quality of life, physical activity, SF-36

Volume 14 Issue 3 - 2026

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Received: October 30, 2026 | **Published:** November 17, 2026

Introduction

Chronic kidney disease (CKD) is a major public health problem characterized by progressive and irreversible loss of kidney function, often leading to high morbidity, mortality, and health care burden. It is estimated that more than 850 million people worldwide are affected by kidney disease, highlighting its growing global impact.[1,2] In Brazil, the 2024 Brazilian Dialysis Census estimated 172,585 patients receiving chronic dialysis, reinforcing the increasing burden of advanced CKD in the country.[3]

The progression of CKD is strongly associated with hypertension, diabetes mellitus, dyslipidemia, and cardiovascular disease. As kidney function declines, patients often experience increasing symptom burden, reduced autonomy, and impaired health-related quality of life (HRQoL).[1,2] Hemodialysis remains the most commonly used kidney replacement therapy in Brazil and worldwide and, although lifesaving, imposes major changes in daily routine, including frequent treatment sessions, fluid and dietary restrictions, and reduced social and occupational flexibility.[3–5]

Reduced physical activity is common across all stages of CKD and has been associated with sarcopenia, fatigue, reduced functional performance, and increased mortality.[6,7] In patients receiving hemodialysis, physical inactivity may further worsen physical and emotional well-being, whereas regular physical activity has been associated with better HRQoL and functional outcomes.[6,8,9] Current World Health Organization recommendations support regular aerobic and muscle-strengthening activity, adapted to individual clinical conditions.[10]

The Medical Outcomes Study 36-Item Short Form Health Survey (SF-36) is a widely used generic instrument for assessing HRQoL and has been extensively applied in patients with CKD, including those undergoing dialysis.[4,11,12] This study aimed to compare HRQoL between patients with CKD receiving conservative treatment and those undergoing maintenance hemodialysis, and to evaluate the association between regular physical activity and HRQoL domains.

Methods

Study design and setting

This was a cross-sectional observational study conducted at the Nephrology and Dialysis Center of Hospital Ernesto Dornelles, Porto Alegre, Brazil.

Participant

A total of 126 adult patients were included: 63 receiving conservative treatment and 63 undergoing maintenance hemodialysis. Eligible patients were aged 18 years or older and had CKD stage G3a, G3b, G4, or G5 under conservative treatment, or had been receiving hemodialysis for at least 3 months. Patients with CKD stages G1 or G2, those hospitalized during the study period, and those on peritoneal dialysis were excluded.

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Data collection

HRQoL was assessed using the Brazilian Portuguese version of the Short Form-36 (SF-36) questionnaire. The instrument was administered in printed form by the hospital psychology team and nephrologists. Clinical and sociodemographic data were obtained from the electronic health record system. Data collection took place between December 2025 and January 2026. All participants provided informed consent, and the study followed applicable ethical standards.

Exposure and outcome variables

The primary exposure variable was treatment modality, categorized as conservative treatment or maintenance hemodialysis. A secondary exposure of interest was self-reported regular physical activity, defined for this study as reporting at least 150 minutes of physical activity per week. This was assessed by self-report and did not include objective monitoring or detailed assessment of intensity or type. The primary outcome was HRQoL measured through SF-36 domain scores: physical functioning, role physical, bodily pain, general health, vitality, social functioning, role emotional, and mental health.

Statistical analysis

Data were entered into Excel and analyzed using SPSS version 20.0. Categorical variables were described as frequencies and percentages and compared using chi-square or Fisher exact tests, as appropriate. Normality was assessed with the Shapiro–Wilk test. Normally distributed continuous variables were expressed as mean ± standard deviation and compared using Student's t-test; nonnormally distributed variables were expressed as median (interquartile range) and compared using the Mann–Whitney U test or Kruskal–Wallis test, as appropriate. Multiple linear regression models were fitted separately for each SF-36 domain, with treatment group, age, and cancer entered simultaneously as independent variables. Results are presented as unstandardized regression coefficients (B), 95% confidence intervals (CIs), and p-values; model R^2, adjusted R^2, and overall model p-values are also reported. Anemia was not included in the adjusted models because all patients receiving hemodialysis had anemia, limiting variability across groups. Statistical significance was set at $p < 0.05$.

Results

Participant characteristics

A total of 126 patients with CKD were included, with no missing data reported. Patients receiving conservative treatment were older than those receiving hemodialysis (75.0±10.8 vs 67.3±15.7 years; P=0.002). Sex and race distributions were similar between groups. Hypertension, diabetes mellitus, dyslipidemia, cardiovascular disease, pulmonary disease, and urologic disease did not significantly differ between groups. Cancer was more frequent among patients receiving conservative treatment (36.5% vs 11.1%; P=0.001), whereas anemia was more prevalent among patients receiving hemodialysis (100% vs 55.6%; P<0.001). Baseline demographic characteristics and comorbidities are summarized in Table 1.

Table 1 Participant demographic characteristics and comorbidities by CKD stage and treatment group

KDIGO eGFR stages						
Variable	**G3a**	**G3b**	**G4**	**G5**	**Total CKD**	**Dialysis**
Age (years), mean ± SD	69.1± 6.3	76.4 ± 9.5	75.5 ±12.7	74.3 ± 12.5	75.0 ± 10.8	67.3±15.7
Sex, n (%)						
Female	3	12	11	3	29	31
	-42.90%	-46.20%	-50%	-37.50%	-46%	-49.20%
Male	4	14	11	5	34	32
	-57.10%	-53.80%	-50%	-62.50%	-54%	-50.80%
Race, n (%)						
White	5	24	17	8	54	48
	-71.40%	-92.30%	-77.30%	-100%	-85.70%	-76.20%
Mixed Race	2	1	2	0	5	4
	-28.60%	-3.80%	-9.10%	0.00%	-7.90%	-6.30%
Black	0	1	3	0	4	11
	0.00%	-3.80%	-13.60%	0.00%	-6.30%	-17.50%
Hypertension, n (%)						
Yes	6	25	20	8	59	57
	-85.70%	-96.20%	-90.90%	-100%	-93.70%	-90.50%
No	1(14.3%)	1 (3.8%)	2 (9.1%)	0 (0.0%)	4 (6.3%)	6 (9.5%)
Diabetes mellitus, n (%)						
Yes	2	12	8	4	26	28
	-28.60%	-46.20%	-36.40%	-50%	-41.30%	-44.40%
No	5	14	14	4	37	35
	-71.40%	-53.80%	-63.60%	-50%	-58.70%	-55.60%
Dyslipidemia, n (%)						
Yes	3	18	15	4	40	36
	-42.90%	-69.20%	-68.20%	-50%	-63.50%	-57.10%
No	4	8	7	4	23	27
	-57.10%	-30.80%	-31.80%	-50%	-36.50%	-42.90%

Table 1 Continued.....

Cardiovascular diseases, n (%)						
Yes	2	9	8	4	23	31
	-28.60%	-34.60%	-36.40%	-50%	-36.50%	-49.20%
No	5	17	14	4	40	32
	-71.40%	-65.40%	-63.60%	-50%	-63.50%	-50.80%
Pulmonary disease, n (%)						
Yes	1	1	1	3	6	8
	-14.30%	-3.80%	-4.50%	-37.50%	-9.50%	-12.70%
No	6	25	21	5	57	55
	-85.70%	-96.20%	-95.50%	-62.50%	-90.50%	-87.30%
Cancer, n (%)						
Yes	3	8	9	3	23	7
	-42.90%	-30.80%	-40.90%	-37.50%	-36.50%	-11.10%
No	4	18	13	5	40	56
	-57.1	-69.20%	-59.10%	-62.50%	-63.50%	-88.90%
Anemia, n (%)						
Yes	3	16	11	5	35	63
	-42.90%	-61.50%	-50%	-62.50%	-55.60%	-100%
No	4	10	11	3	28	0
	-57.10%	-38.50%	-50%	-37.50%	-44.40%	0.00%
Urologic disease, n (%)						
Yes	2	8	5	4	19	13
	-28.60%	-30.80%	-22.70%	-50%	-30.20%	-20.60%
No	5	18	17	4	44	50
	-71.40%	-69.20%	-77.30%	-50%	-69.80%	-79.40%

Values are expressed as mean ± standard deviation or n (%).

Comparisons were performed using *Student´s t-test* for continuous variables and the *chi-square test* or *Fisher´s exact test* for categorical variables, as appropriate.

Abbreviations: CKD, chronic kidney disease; eGFR: estimated glomerular filtration rate.

Among patients receiving hemodialysis, the most frequent vascular access was a tunneled long-term catheter (49.2%), followed by arteriovenous fistula (42.9%). Most patients underwent hemodialysis 3 times per week (95.2%), and 52.4% had sessions lasting 4 hours.

Physical activity

Regular physical activity was infrequent and similarly distributed between groups (36.5% in outpatients vs 34.9% in patients receiving hemodialysis; P=0.853). Physical activity by CKD stage is presented in Table 2.

Table 2 Regular physical activity by CKD stage and treatment group

KDIGO eGFR stages						
	G3a	**G3b**	**G4**	**G5**	**Total CKD**	**Dialysis**
Regular physical activity, n (%)						
	2	12	8	1	23	22
Yes	-28.60%	-46.20%	-36.40%	-12.50%	-36.50%	-34.90%
	5	14	14	7	40	41
No	-71.40%	-53.80%	-63.60%	-87.50%	-63.50%	-65.10%

Values are expressed as n (%).

Comparisons were performed using the chi-square test or Fisher´s exact test, as appropriate. Abbreviations: CKD, chronic kidney disease.

Health-related quality of life

No statistically significant differences were observed between patients receiving conservative treatment and those receiving hemodialysis in any SF-36 domain. Comparisons of SF-36 domain scores between non-dialysis and hemodialysis patients and across CKD stages are presented in Table 3 & Table 4, respectively. After adjustment for age and cancer, treatment group was not independently associated with any of the eight SF-36 domains (all $p > 0.05$). In the Physical Functioning model, the overall model was statistically significant ($R^2 = 0.089$; adjusted $R^2 = 0.067$; $p = 0.010$), and age was associated with lower scores ($B = -0.673$; 95% CI −1.061 to −0.285; $p = 0.001$). For Bodily Pain, the age coefficient was also

nominally significant (B = −0.375; 95% CI −0.744 to −0.005; p = 0.047), although the overall model was not statistically significant (p = 0.093); this finding should be interpreted cautiously. Full regression results are presented in Table 5. No statistically significant differences were found across CKD stages.

Table 3 Comparison of SF-36 domain scores between non-dialysis and hemodialysis patients

SF-36 Domains	Non-dialysis (n=63) (0 - 100)	Dialysis (n=63) (0 - 100)	P value
Physical Functioning	50 (30 - 75)	50 (20 - 75)	0.796
Role-Physical	25 (0 - 100)	50 (0 - 100)	0.508
Bodily Pain	61 (31 - 64)	52 (31 - 84)	0.217
General Health	57 (42 - 72)	57 (35 - 67)	0.544
Vitality	55 (40 - 70)	55 (40 - 70)	0.499
Social Functioning	63 (38 - 88)	75 (50 - 100)	0.078
Role-Emotional	67 (0 - 100)	67 (33 - 100)	0.144
Mental Health	72 (56 - 88)	76 (56 - 92)	0.447

Values are expressed as median (interquartile range).

Comparisons between groups were performed using the *Mann–Whitney U test*.

Abbreviations: SF-36, 36-Item Short Form Health Survey.

Table 4 Comparison of SF-36 domain scores across non-dialysis CKD stages and hemodialysis

SF-36 Domains	G3a (n=7) (0 - 100)	G3b (n=26) (0 - 100)	G4 (n=22) (0 - 100)	G5 (n=8) (0 - 100)	Dialysis (n=63) (0 - 100)	P value
Physical Functioning	65 (40 - 75)	58 (34-90)	50 (19-73)	43 (14-55)	50 (20-75)	0.48
Role-Physical	75 (0 - 100)	25 (0-75)	25 (0-100)	50 (0-94)	50 (0-100)	0.907
Bodily Pain	51(41 - 62)	52 (41-84)	41(20-55)	31 (20-67)	52 (31-84)	0.255
General Health	57 (47 - 87)	57 (42-68)	55 (47-78)	36 (23-54)	57 (35-67)	0.203
Vitality	50 (40 - 65)	55 (42-68)	58 (44-75)	43 (11-60)	55 (40-70)	0.547
Social Functioning	75 (38 - 100)	63 (38-75)	69 (47-88)	56 (28-100)	75 (50-100)	0.527
Role-Emotional	100 (67 - 100)	67 (50-78)	33 (0-100)	17 (0-100)	67 (33-100)	0.172
Mental Health	80 (60 - 84)	70 (25-100)	78 (64-92)	66 (53-86)	76 (56-92)	0.765

Values are expressed as median (interquartile range). Comparisons were performed using the *Kruskal-Wallis test.*

Abbreviations: CKD, chronic kidney disease; SF-36, 36-Item Short Form Health Survey.

Table 5 Multiple linear regression models for SF-36 domains adjusted for treatment group, age, and cancer

	Predictor	B (95% CI)	p-value	Model R^2	Adjusted R^2	Overall model p
Physical Functioning	Treatment group	−5.962 (−17.218 to 5.294)				
Physical Functioning	Cancer	2.460 (−10.301 to 15.221)	0.703			
Physical Functioning	Age	−0.673 (−1.061 to −0.285)	0.001			
Role-Physical	Treatment group	2.185 (−13.780 to 18.151)	0.787	0.012	−0.012	0.675
Role-Physical	Cancer	0.575 (−17.526 to 18.675)	0.95			
Role-Physical	Age	−0.303 (−0.854 to 0.247)	0.278			
Bodily Pain	Treatment group	5.490 (−5.230 to 16.211)	0.313	0.051	0.028	0.093
Bodily Pain	Cancer	2.804 (−9.350 to 14.958)	0.649			
Bodily Pain	Age	−0.375 (−0.744 to −0.005)	0.047			
Bodily Pain	Treatment group	−1.946 (−10.382 to 6.490)	0.649	0.006	−0.018	0.858
General Health	Cancer	0.783 (−8.781 to 10.346)	0.872			
General Health	Age	0.074 (−0.217 to 0.365)	0.614			
Vitality	Treatment group	3.562 (−5.150 to 12.273)	0.42	0.039	0.016	0.177
Vitality	Cancer	5.709 (−4.168 to 15.585)	0.255			
Vitality	Age	−0.252 (−0.553 to 0.048)	0.099			
Social Functioning	Treatment group	8.657 (−1.909 to 19.223)	0.107	0.026	0.002	0.356

Social Functioning	Cancer	2.366 (−9.613 to 14.345)	0.696			
Social Functioning	Age	−0.062 (−0.427 to 0.302)	0.737			
Role-Emotional	Treatment group	15.466 (−0.351 to 31.282)	0.055	0.045	0.021	0.131
Role-Emotional	Cancer	16.841 (−1.091 to 34.772)	0.065			
Role-Emotional	Age	0.010 (−0.536 to 0.555)	0.972			
Mental Health	Treatment group	2.561 (−5.520 to 10.643)	0.532	0.037	0.014	0.2
Mental Health	Cancer	8.178 (−0.984 to 17.339)	0.08			
Mental Health	Age	−0.169 (−0.447 to 0.110)	0.233			

B, unstandardized regression coefficient; CI, confidence interval. Each model included treatment group, age, and cancer.

Treatment group was coded as 1 = hemodialysis and 0 = non-dialysis outpatient care; therefore, the treatment-group coefficient represents the adjusted mean difference (hemodialysis minus non-dialysis). Model R^2, adjusted R^2, and overall model p-values refer to the full model.

Association between physical activity and HRQoL

Among non-dialysis patients, regular physical activity was associated with higher scores in the physical functioning, vitality, and role-emotional domains. Among patients receiving hemodialysis, physical activity was associated with higher scores in physical functioning, role physical, bodily pain, vitality, and role emotional domains. Associations between physical activity and SF-36 domain scores are shown in Table 6.

Table 6 Association between physical activity and SF-36 domain scores by treatment group

	Non-Dialysis			Dialisys		
SF-36 Domains	**Physically active (n= 23) (0-100)**	**Physically inactive (n=40) (0-100)**	**P value**	**Physically active (n= 22) (0-100)**	**Physically inactive (n= 41)**	**P value**
Physical Functioning	75 (60-90)	38 (16-55)	<0.001	73 (30-91)	40 (18-68)	0.023
Role-Physical	75 (0-100)	25 (0-75)	0.128	75 (19-100)	25 (0-75)	0.039
Bodily Pain	52 (41-74)	41(23-60)	0.059	67 (51-100)	51 (26-62)	0.001
General Health	62 (47-77)	56 (40-67)	0.169	62 (47-73)	52 (30-62)	0.097
Vitality	65 (55-75)	50 (33-65)	0.014	63 (54-85)	50 (38-70)	0.011
Social Functioning	75 (50-88)	63 (38-88)	0.423	88 (63-100)	63 (50-100)	0.124
Role-Emotional	67 (33-100)	33 (0-100)	0.048	100 (58-100)	67 (0-100)	0.021
Mental Health	76 (60-88)	68 (49-87)	0.21	78 (63-96)	76 (54-90)	0.285

Values are expressed as median (interquartile range).

Comparisons between physically active and inactive patients were performed using *Mann–Whitney U test.*

Abbreviations: SF-36, 36-Item Short Form Health Survey.

Discussion

In this cross-sectional study of patients with CKD managed conservatively or receiving maintenance hemodialysis, HRQoL did not differ significantly between treatment groups across SF-36 domains, including after adjustment for age and cancer. In the multivariable models, treatment group was not independently associated with any domain. Age was associated with lower Physical Functioning scores; an association between age and Bodily Pain was also observed, but the overall model for that domain was not statistically significant and the finding warrants caution. Anemia was not included in the adjusted models because all patients receiving hemodialysis had anemia, limiting variability across groups. These findings are consistent with studies suggesting that HRQoL in CKD is multifactorial and not determined solely by treatment modality.[4,11–14]

Even before dialysis initiation, patients with CKD may experience a substantial burden related to comorbid conditions, functional limitation, and symptom perception.[2,15] Conversely, although maintenance hemodialysis imposes major treatment-related burdens, adaptation to treatment routines and frequent multidisciplinary support may partly mitigate some aspects of perceived HRQoL.[5,16]

One of the main findings of this study was the association between regular physical activity and better HRQoL in selected domains. This pattern was observed in both treatment groups and was particularly evident for physical functioning, vitality, and emotional role limitations. These findings are consistent with previous reports demonstrating associations between physical activity, better functional capacity, and improved quality of life in CKD and hemodialysis populations.[6,9]

The high frequency of physical inactivity in this cohort reinforces the need to incorporate structured and individualized exercise counseling into routine CKD care. Physical activity may represent a low-cost, nonpharmacologic strategy to improve function, emotional well-being, and patient-centered outcomes.[6,8–10]

This study has important limitations. First, the cross-sectional design precludes causal inference. Second, this was a single-center study with limited sample size in some subgroups. Third, both physical activity and HRQoL are subject to reporting bias. Nonetheless, the study adds to the literature by comparing non-dialysis and hemodialysis CKD populations within the same center and by highlighting the possible role of physical activity in selected HRQoL domains.

Conclusions

In this sample of patients with CKD, HRQoL did not differ significantly between those receiving conservative treatment and those undergoing maintenance hemodialysis, including after adjustment for age and cancer. Age was associated with lower Physical Functioning scores. Self-reported regular physical activity was associated with better HRQoL in selected SF-36 domains, but the cross-sectional design does not allow causal inference.

Ethical approval

This study was approved by the Research Ethics Committee of Ernesto Dornelles Hospital (approval no. 8.033.157/2025). All participants provided written informed consent.

Conflicts of interest

The authors declare no conflict of interest.

Consent to participate

All participants provided written informed consent to participate in the study.

Data availability

The dataset analyzed during the current study is not publicly available due to ethical and privacy restrictions but may be obtained from the corresponding author upon reasonable request.

Funding

This study received no specific funding.

References

1. Kidney Disease: Improving Global Outcomes (KDIGO) CKD Work Group. KDIGO 2024 clinical practice guideline for the evaluation and management of chronic kidney disease. *Kidney Int.* 2024;105(4 suppl 1):S117S–314.
2. Jha V, Garcia–Garcia G, Iseki K, et al. Chronic kidney disease: global dimension and perspectives. *Lancet.* 2013;382(9888):260–272.
3. Nerbass FB, Lima HN, Zawadzki B, et al. Brazilian Dialysis Census 2024. *Braz J Nephrol.* 2026;48(1):e20250112.
4. Cruz MC, Andrade C, Urrutia M, et al. Quality of life in patients with chronic kidney disease. *Clinics (Sao Paulo).* 2011;66(6):991–995.
5. Santos BP, Oliveira VA, Soares MC, et al. Chronic kidney disease: patients' relationship with hemodialysis. *ABCS Health Sci.* 2017;42(1):8–14.
6. Zhang F, Wang H, Wang W, et al. The role of physical activity and mortality in hemodialysis patients: a review. *Front Public Health.* 2022;10:818921.
7. Morishita S, Tsubaki A, Shirai N. Physical function was related to mortality in patients with chronic kidney disease and dialysis. *Hemodial Int.* 2017;21(4):483–489.
8. Filipčič T, Bogataj Š, Pajek J, et al. Physical activity and quality of life in hemodialysis patients and healthy controls: a cross–sectional study. *Int J Environ Res Public Health.* 2021;18(4):1978.
9. Wu YH, Hsu YJ, Tzeng WC. Physical activity and health–related quality of life of patients on hemodialysis with comorbidities: a cross–sectional study. *Int J Environ Res Public Health.* 2022;19(2):811.
10. World Health Organization. *WHO Guidelines on Physical Activity and Sedentary Behaviour.* World Health Organization; 2020.
11. Castro M, Caiuby AVS, Draibe SA, et al. Quality of life of patients with chronic renal failure on hemodialysis evaluated using the SF–36. *Rev Assoc Med Bras (1992).* 2003;49(3):245–249.
12. Levey AS, Coresh J. Chronic kidney disease. *Lancet.* 2012;379(9811):165–180.
13. Grincenkov FRS, Fernandes N, Chaoubah A, et al. Factors associated with quality of life in incident peritoneal dialysis patients in Brazil (BRAZPD). *J Bras Nefrol.* 2011;33(1):38–44.
14. Lopes JM, Fukushima RLM, Inouye K, et al. Health–related quality of life in chronic kidney disease patients on dialysis. *Acta Paul Enferm.* 2014;27(3):230–236.
15. Daugirdas JT, Blake PG, Ing TS, eds. *Handbook of Dialysis.* 4th ed. Lippincott Williams & Wilkins; 2007.
16. Valderrábano F, Jofre R, López–Gómez JM. Quality of life in end–stage renal disease patients. *Am J Kidney Dis.* 2001;38(3):443–464.