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Original Article

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Health-Related Quality of Life of Patients with Chronic Kidney Disease on Maintenance Hemodialysis and Its Determinants: A Study from a Tertiary Hospital in South India

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ABSTRACT

Background: The overall quality of life of patients with chronic kidney disease undergoing hemodialysis has not substantially improved over the years, despite the quality care provided by health-care providers. Due to the chronic nature of the disease, there is substantial psychosocial burden on patients and caregivers alike. This study was done to measure health-related quality of life (HRQOL) in our patients and to delineate the factors that influence HRQOL.

Methods: This was a single-center prospective cohort study. 191 patients were studied and followed up for up to 1 year. We used independent t test/Mann Whitney U test/ANOVA/Kruskal Wallis test to find the association between sociodemographic and clinical parameters with QOL domains.

Results: We found that patients who were actively working had better HRQOL as compared to unemployed patients ($P < 0.001$). Patients who were older, those who had longer vintage of dialysis, diabetes, cardiovascular comorbidities, with history of noncompliance with hemodialysis, and an increased annual hospitalization rate had worse HRQOL ($P < 0.001$). We also found that patients who had higher phosphate levels and lower albumin levels had lower HRQOL ($P < 0.001$). Patients with higher HRQOL scores were detected to have lower odds of death [Odds ratio of Symptom/Problem List score= 0.96 (95% CI, 0.938-0.995)], which was statistically significant ($P = .02$).

Conclusion: This study gives an insight into the socioeconomic and medical factors associated with the QOL in chronic kidney disease patients on hemodialysis in Bengaluru, South India. Our study shows that there is poor HRQOL among hemodialysis patients and a significant association with morbidity and mortality.

Keywords: HRQOL, KDQOL-36™, CKD G5D, end-stage kidney disease, chronic kidney disease, hemodialysis

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INTRODUCTION

The availability of dialysis as a mode of kidney replacement therapy (KRT) has been one of the greatest advancements in medicine. However, despite the quality care provided by health-care providers, there has been no significant improvement in patient satisfaction. Most patients focus on the quality of life (QOL) rather than the prolongation of their lifespan.

The World Health Organization defines QOL as an individual's perception of their position in life in the context of their culture, value system, and relationship to life goals, expectations, standards, and other related matters. Many studies from Greece,[1] Ethiopia,[2] Egypt,[3] Korea[4] and USA[5] have reported on the QOL of patients with chronic kidney disease on hemodialysis (CKDG5D). There are very few studies on the same in India. Also, in a place as diverse as India, there is much variation in the socioeconomic status, educational status, gender equality, residence in urban or rural region, support system at home or hospital, and modes of travel, which leads to varying patient perceptions of the QOL. Having

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baseline data helps us to look into the caveats of health-care delivery and gives us an opportunity to intervene and individualize treatment for a better QOL in this group of patients.

Thus, our study was done with the following objectives:

a) To assess the health-related QOL(HRQOL) in patients undergoing maintenance hemodialysis with Kidney Disease QOL 36 item questionnaire (KDQOL-36™);
b) To examine various factors that can influence HRQOL and
c) To analyze the effect of HRQOL on mortality.

MATERIAL AND METHODS

All CKDG5D patients on maintenance hemodialysis for a minimum period of 6 months, aged more than 18 years, and undergoing hemodialysis in our center from November 1, 2021 to October 31, 2022, were included in this study. We have excluded patients who had a history of previous transplants, patients with advanced malignancy or psychiatric diseases, patients who were switched over from peritoneal dialysis, those patients who were unwilling to be a part of this study, and whose minimum period of follow-up was less than 6 months.

This study had approval from the institutional ethical committee prior to commencement M. S. Ramaiah Medical College, Bangalore 560054 (DRP/IFP735/2021; Dated: October 9, 2021), and a written informed consent was taken from each participant enrolled in the study.

Sociodemographic parameters (age, sex, type of payment, education status, annual income), clinical history, including comorbidities, CKD, and dialysis, were recorded for each patient (Table 1).

The hemodialysis prescription given was empiric: patients having a good residual urine output of more than 500 mL per

MAIN POINTS:

- Patients who were employed had better health-related quality of life (HRQOL).
- Patients who were older, those who had longer vintage on hemodialysis, with diabetes mellitus, cardiovascular comorbidities, a history of noncompliance with hemodialysis and an increased annual hospitalization rate had worse HRQOL.
- Patients who had higher phosphate levels and lower albumin levels had lower HRQOL.
- This study emphasizes the need for an assessment of the QOL of each patient at regular intervals as a part of comprehensive patient-centered care.
- Health-related QOL can predict the risk of death; thus, early, individualized intervention can improve short- and long-term outcomes as well.

Table 1. Baseline Characteristics

Parameters (n = 191)		**n (%)**
Demographic parameters		
Age (years)	18-30	20 (10.4)
	31-40	29 (15.1)
	41-50	37 (19.3)
	51-60	49 (25.6)
	>60	56 (29.3)
Payment	Self paying	76 (40)
	Scheme/insurance	115 (60)
Sex	Male	130 (70)
	Female	56 (30)
Education/ Work status	Primary or below	9 (4.7)
	Secondary	39 (20)
	Graduate	92 (48)
	Postgraduate	33 (17)
	Still working	54 (28.3)
	Retired/unemployed	137 (71.7)
Annual per capita income in USD	>611	49 (25.6)
	366-611	48 (25)
	244-365	61(32)
	<244	33 (17.2)
Distance from hemodialysis center	<5 km	25 (13)
	5-15 km	111 (58)
	16-25 km	35 (18.3)
	25-50 km	20 (10.4)
Clinical and dialysis parameters		
Diabetes mellitus	Present	89 (46.5)
Comorbidities	Yes	120 (62.8)
	No	71 (37.1)
Frequency of dialysis (per week)	Twice	82 (43)
	Thrice	109 (57)
Access complications	Yes	91 (47.6)
	No	100 (52.4)
Outcomes		
Hospitalization (per year)	None	80 (41.8)
	One or more	57 (29.8)
	Two	34 (17.8)
	Three or more	20 (10.4)
Mortality		42 (22)

day were prescribed hemodialysis twice per week to start with and the rest of the patients were prescribed hemodialysis 3 time. Due to financial limitations, most patients are initially provided with an empirical prescription. Additionally, Kt/V is calculated for all our patients at regular intervals (every 3 months), and we aimed to maintain a Kt/V of >1.2. Target blood flow during hemodialysis was 250-300 mL/min, with a dialysate flow rate of 500 mL/min and all patients were dialyzed with Nipro machines with Elisio low flux single-use polysulfone dialyzer (according to body surface area). Serology is done prior to the initiation of hemodialysis and is repeated every other 3 months. We described noncompliance as skipping one or more hemodialysis sessions/decreasing each session by more than 30 minutes of the prescribed time. All patients were vaccinated against Hepatitis B and pneumococcus. The mean of the last 3 measurements of routine laboratory parameters, including hemoglobin, calcium, phosphorous, and uric acid, were recorded.

The HRQOL was evaluated by the KDQOL-36™ version 1.3 questionnaire, a validated KDQOL instrument (RAND Corporation, Santa Monica, Calif, USA) that is available free for noncommercial purposes.[6] The raw scores are converted to 5 subscale scores [mental component summary, physical component summary, burden of kidney disease (burden), symptoms and problems of kidney disease (symptoms), and effects of kidney disease (effect)] using the Microsoft Excel tool (KDQOL-36 Scoring Program, version 2.0; UCLA Division of General Internal Medicine and Health Services Research 2001). This scoring program gives a score in the range of 1-100 for each subscale, with the higher numeric value of the scores being reflective of a better perceived QOL.

The first 12 items on the questionnaire are measures of physical and mental functioning, with items about general health, activity limits, ability to accomplish desired tasks, depression and anxiety, energy level, and social activities.

The burden of kidney disease subscale (items 13-16) elicits how kidney disease interferes with daily life, takes up time, causes frustration, or makes the respondent feel like a burden.

The symptoms and problems subscale (items 17-28) evaluates how bothered a respondent feels by sore muscles, chest pain, cramps, itchy or dry skin, shortness of breath, faintness/dizziness, lack of appetite, feeling washed out or drained, numbness in the hands or feet, nausea, or problems with dialysis access.

The effects subscale (items 29-36) elicits information about how bothered the respondent feels by fluid limits, diet restrictions, the ability to work around the house or travel, feeling dependent on doctors and other medical staff, stress or worries, sex life, and personal appearance.

These patients were followed up for a period of 1 year or until they switched over to another mode of KRT or death. They were seen at regular intervals while they were undergoing hemodialysis, and clinical outcomes including access failures, hospitalizations, and causes of death were recorded during the follow-up period.

Statistics

In the literature review, a similar study was done by Veerappan I et al,[7] who investigated the HRQOL in CKD5D patients undergoing hemodialysis in a tertiary care hospital. According to this study, the mean mental component summary (MCS) score was 33.29 (±4.91). Expecting similar results with 0.8% precision and a 95% CI, the minimum sample required was 148.

Kolmogorov–Smirnov test was used to test normality. Continuous variables like age, laboratory investigations, and HRQOL scores were presented with mean and standard deviation or median and interquartile range, as appropriate. Categorical variables like sex and comorbidities were reported with frequency and percentage. Independent *t*-test or Mann–Whitney *U*-test was used to find the association between clinical and sociodemographic parameters with QOL domains like sex, payment mode, frequency of dialysis, mortality, and laboratory investigations. Analysis of variance or Kruskal–Wallis test was used when comparison parameter had more than 2 categories such as age, education, annual per capita income, and distance from the hemodialysis center. Logistic regression was used to predict mortality based on QOL domains. The results were considered statistically significant at the level of alpha <0.05 in all analyses. Statistical analysis was performed using IBM Statistical Package for the Social Sciences Statistics for Windows, version 27.0 (IBM SPSS Corp.; Armonk, NY, USA).

RESULTS

Around 280 patients underwent regular hemodialysis in our center for a period of more than 6 months. Eighty-nine patients were excluded due to exclusion criteria, and hence the final analysis included 191 patients. The mean age of patients was 53 ± 14.7 years. The socioeconomic characteristics of the patients are summarized in Table 1.

The primary disease in the majority of our patients was diabetic nephropathy (45.5%), and 62.8% of patients had associated cardiovascular comorbidities as heart failure, coronary artery disease, prior revascularization, stroke, or peripheral vascular disease

In our study, the majority of the patients (42.4%) met a nephrologist for the first time within less than a month of initiation of hemodialysis, and 40% of patients presented with acute symptoms, requiring hemodialysis to be initiated on an emergency basis in the intensive care unit. The mean age of initiation of hemodialysis was 49.8 ±15.03 years. 43% of the patients

Table 2. Relevant Biochemical Investigations and Kidney Disease and Quality of Life 36™ Scores (n = 191)

Parameters	Mean (± Standard Deviation)
Biochemical tests	
Hemoglobin (g/dL)	8.95 ± 1.60
Serum calcium (mg/dL)	8.46 ± 0.69
Serum phosphate (mg/dL)	5.89 ± 3.38
Serum parathyroid hormone (pg/mL)	581 (300-929)*
Serum albumin (g/dL)	3.77 ± 0.54
Serum uric acid (mg/dL)	5.48 ± 1.78
KDQOL-36 scores	
Symptom/problem list	79.61 ± 11.99
Effects of kidney disease	76.15 ± 11.93
Burden of kidney disease	23.51 ± 17.33
SF-12 physical composite	36.67 ± 13.43
SF-12 mental composite	49.35 ± 7.90

KDQOL-36, Kidney Disease and Quality of Life 36™ questionnaire.
*Median (interquartile range)

underwent hemodialysis twice per week, and 57% of patients underwent hemodialysis thrice per week. 17 patients (8.9%) were noncompliant with respect to the frequency or duration of dialysis. The mean Kt/V for all patients was 1.25 ± 0.2. The medical characteristics of the patients studied are summarized in Table 2.

The mean KDQOL-36 scores of our patients were symptom/problem list, 79.61 ± 11.99; effects of kidney disease, 76.15 ± 11.93; burden of kidney disease, 23.51 ± 17.33; SF-12 Physical Composite Summary (PCS), 36.67 ± 13.43; SF-12 MCS, 49.35 ± 7.90 (Table 2).

Outcomes

Fifty-eight percent of the patients had one or more hospitalizations during the study period. The cause of hospitalization is summarized in Figure 1. During the study period, 42 (22%) patients died, and the most common cause of death was cardiovascular events (Figure 2). Fourteen patients received a kidney transplant.

Health-Related Quality of Life and Their Associations

The comparison of the subgroups formed according to socioeconomical factors regarding QOL measures is presented in Table 3. We found no significant difference in HRQOL between males or females, socioeconomic status, payment mode, travel distance, or educational status. Patients who were actively working had better HRQOL as compared to patients who were retired.

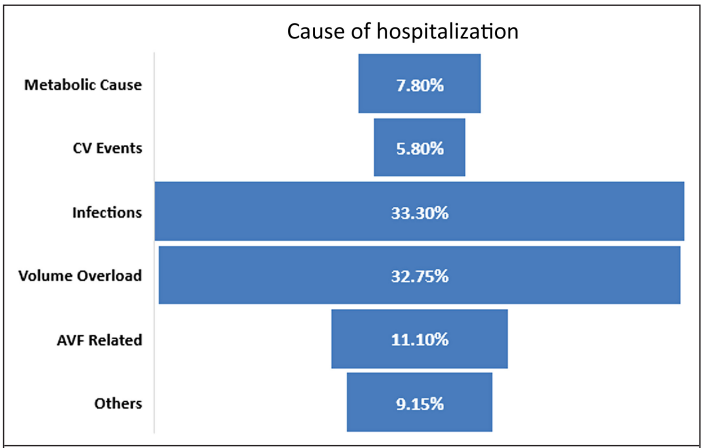

Figure 1. Cause of Hospitalization. CV, Cardiovascular Events; AVF, Arteriovenous Fistula/Graft.

Comparison of patients grouped according to clinical and dialysis-related parameters is presented in Table 4. Patients of older age on dialysis for a longer time had worse QOL. Additionally, patients who have a history of diabetes and other comorbidities had worse QOL, while we found no significance between the frequency of dialysis and between different types of AV access or the presence of access complications. Noncompliant patients had worse QOL.

Analysis of QOL scores of patients grouped according to the laboratory values is presented in Table 5. Patients with higher phosphate levels and lower albumin levels had lower QOL, which was statistically significant. No statistical significance was found in patients with different hemoglobin and ferritin levels.

Presence of cardiovascular comorbidities, with or without a history of hospitalization, was also associated with poor QOL. Around 52% of the patients had a history of at least 1

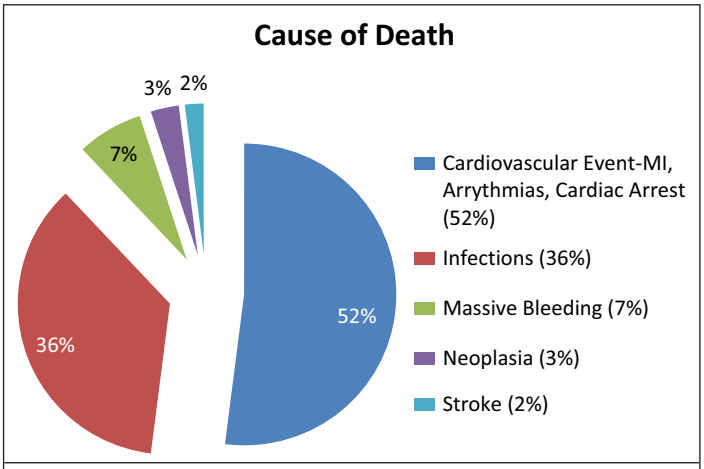

Figure 2. Cause of Death. MI, Myocardial Infarction.

Table 3. Kidney Disease and Quality of Life 36™ Scores Association with Socioeconomic Characteristics

Parameters n = 191	N	Symptom/ Problem of Kidney Disease Mean (±SD*)	Effects of Kidney Disease Mean (SD*)	Physical Component Summary Mean (SD*)	Mental Component Summary Mean (SD*)	Burden of Kidney Disease, (Median (IQR#))
Gender						
Male	130	79.4 (±12.2)	76.6 (±12.5)	36.6 (±13)	49.3 (±7.7)	25 (6.2-37.5)
Female	56	79.9 (±11.6)	75.1 (±10.4)	36.8 (±14.2)	49.3 (±8.2)	25 (0-37.5)
P-value		.81	.4	.93	.98	.72
Payment mode						
Self	83	81.1 (±12.1)	76.9 (±12.7)	38.3 (±14.3)	49.7 (±7.8)	25 (6.2-37.5)
Scheme/insurance	108	78.4 (±11.7)	75.5 (±11.2)	35.3 (±12.5)	49 (±7.9)	25 (3.2-37.5)
P-value		.13	.45	.16	.58	.12
Educational qualification						
Primary or below	9	76.6 (±6.8)	72. (±11.1)	29.7 (±11.2)	49.3 (±5.8)	25 (0-25)
Secondary	39	80 (±10.7)	75.9 (±12.1)	36.8 (±12.6)	49.5 (±7.8)	25 (6.2-37.5)
Graduate	92	79.3 (±12.9)	76.1 (±12.3)	36.8 (±13.9)	48.8 (±8.3)	18.7 (6.2-37.5)
Postgraduate	33	80.7 (±12.1)	77.4 (±11)	37.8 (±13.3)	50.4 (±7.3)	25 (15.6-37.5)
P-value		.81	.75	.44	.80	.28
Annual per capita income in USD						
>611	49	80.9 (±10.8)	77.2 (±12)	37.2 (±13.9)	48.6 (±7.6)	25 (9.3-37.5)
366-611	48	81.4 (±12.1)	76.2 (±12.3)	38.9 (±14.3)	50.4 (±7.5)	25 (12.5-37.5)
244-365	61	79.1 (±11.6)	74.6 (±12.4)	37.5 (±13.3)	48.6 (±8.3)	25 (6.2-37.5)
<244	33	76.1 (±13.6)	76.79 (±10.6)	31.8 (±10.8)	50.13 (±8.1)	18.7 (0-31.2)
P-value		.23	.72	.12	.62	.20
Distance from hemodialysis center						
<5 km	25	79.9 (±16)	77.5 (12.1)	37.8 (13.8)	48.4 (±9.68)	25 (3.1-37.5)
5-15 km	111	80.8 (±11.3)	76 (12.1)	37.5 (13.9)	49.5 (±8)	26 (6.2-37.5)
16-25 km	35	76.1 (±11.8)	74.5 (11.9)	33.9 (12.6)	48.8 (±6.4)	18.7 (4.6-26.5)
>25	20	77 (±7.51)	75.9 (10.4)	33.6 (10.5)	49.7 (±6.6)	18.7 (0-37.5)
P-value		.39	.62	.28	.87	.46
Employment status						
Still working	54	85.3 (±10.7)	81.3 (10.2)	44.1 (12.7)	52.8 (±4.6)	37.5 (23.4-37.5)
Retired/Unemployed	137	77.9 (±11.8)	74.6 (12)	34.5 (12.9)	48.3 (±8.3)	25 (0-37.5)
P-value		.001	.002	.001	<.001	.003

*SD, standard deviation.
#IQR, interquartile range.

hospitalization during the 1 year of study, and these patients had a worse HRQOL.

In our study, the 1-year mortality rate was 22%. The most common cause of death was cardiovascular events (52%), followed by infections (36%). Patients who died during follow-up had a worse QOL as compared to patients who had survived, which was statistically significant.

By univariate logistic regression, we found that the participants who have higher scores in KDQOL-36 have lower odds of death, which was statistically significant (Table 6).

Table 4. Kidney Disease and Quality of Life 36™ Scores Association with Medical Characteristics

Parameters	N	Symptom/ Problem of Kidney Disease Mean (SD*)	Effects of Kidney Disease Mean (SD*)	Physical Component Summary Mean (SD*)	Mental Component Summary Mean (SD*)	Burden of Kidney Disease (Median (IQR#))
Age, years category						
18-30	20	86.8 (±1.5)	77.5 (±8.7)	47.1 (±9.5)	54.4 (±2.6)	37.5 (31.2-37.5)
31-40	29	84.7 (±2.2)	79.9 (±12.3)	41 (±12.9)	51.6 (±7.4)	37.5 (7.8-37.5)
41-50	37	82.1 (±2)	77.1 (±11.2)	41.8 (±14)	50.5 (±6.8)	37.5 (3.1-37.5)
51-60	49	78.7 (±1.6)	76.9 (±12.1)	35.8 (±12.5)	48.6 (±7.4)	25 (9.3-37.5)
>60	56	74.4 (±1.6)	72.7 (±12.1)	29.4 (±10.9)	46.8 (±9.1)	18.7 (0-25)
P-value		<.001	.101	<.001	.004	<.001
Vintage period						
Less than a year	38	84.5 (±11.6)	81.2 (±11.8)	43.3 (±13)	51.1 (±6.7)	31.2 (18.7-37.5)
More than a year	153	78.3 (±11.7)	74.8 (±11.6)	34.9 (±13)	48.9 (±8.1)	25 (6.2-37.5)
P-value		.007	.006	.001	.096	.043
Comorbidities						
Yes	120	77.6 (±12)	74.8 (±11.9)	34.5 (±13.2)	48.4 (±7.9)	18.7 (0-37.5)
No	71	83 (±11)	78.4 (±11.6)	40 (±12.9)	51 (±7.6)	37.5 (18.7-43.7)
P- value		.004	.056	.004	.038	<.001
History of diabetes before initiation of hemodialysis						
Yes	89	76.3 (±13.4)	73.9 (±12.6)	34.1(±13.5)	46.7 (±8.5)	18.7 (0-37.5)
No	102	82.4 (±9.8)	78 (±11)	38.8 (±13)	51.5 (±6.5)	31.2 (12.5-37.5)
P- value		.001	.026	.021	<.001	.011
Irregular or regular						
Regular	173	80.5 (±11.8)	76.7 (±11.9)	37.4 (±13.5)	49.9 (±7.5)	25 (6.25-37.5)
Irregular	18	71 (±9.9)	70.7 (±10.9)	29.7 (±10)	43.6 (±8.8)	0 (0-18.7)
P- value		.002	.05	.008	.002	<.001
AV access						
AV Fistula	155	79.7 (±12.4)	76.2 (±11.8)	37.3 (±13.3)	49.3 (±7.9)	25 (6.2-37.5)
AV Graft	20	76.4 (±8.7)	73.4 (±11.5)	30.7 (±12.5)	48.5 (±7.9)	18.7 (1.5-25)
Tunnelled Cather	16	82.5 (±10.7)	78.7 (±12.8)	38.1 (±13.9)	50.4 (±7.5)	25 (7.8-37.5)
P- value		.30	.41	.10	.77	.31
Access complications						
Yes	91	79.4 (±12.4)	76.4(±11.5)	36.8 (±13.3)	49.4 (±8)	25 (0-37.5)
No	100	79.7 (±11.6)	75.9 (±12.3)	36.4 (±13.5)	49.2 (±7.7)	25 (6.2-37.5)
P- value		.90	.79	.84	.87	.60
Frequency of dialysis (per week)						
Twice	82	79.9 (±16)	77.5 (±12.1)	37.8 (±13.8)	48.4 (±9.6)	25 (0-37.5)
Thrice	109	80.8 (±11.3)	76 (±12.1)	37.59 (±13.9)	49.5 (±8)	25 (6.2-37.5)
P- value		.73	.58	.92	.57	.83

(*Continued*)

Table 4. Kidney Disease and Quality of Life 36™ Scores Association with Medical Characteristics (Continued)

Parameters	N	Symptom/ Problem of Kidney Disease Mean (SD*)	Effects of Kidney Disease Mean (SD*)	Physical Component Summary Mean (SD*)	Mental Component Summary Mean (SD*)	Burden of Kidney Disease (Median (IQR#))
Residual urine output per day						
<500 mL	57	79.6 (±11.9)	76 (±12)	36.5 (±13.3)	49.7 (±7.4)	25 (6.2-37.5)
>500 mL	134	79.3 (±12.3)	76.4 (±11.6)	37.1 (±13.8)	48.1 (±9.1)	25 (0-37.5)
P- value		.87	.85	.81	.26	.83
Outcome parameters						
Number of hospitalization						
No admission	80	81.4 (11.5)	77.2 (±12.7)	36.8 (±13.9)	51 (±6.6)	25(7.8-37.5)
Single	57	79.9 (±10.7)	76.6 (±10.6)	36.3 (±13.2)	49.1 (±8.1)	25 (6.2-37.5)
2	34	79.8 (±11.4)	76.9 (±12)	36.1 (±12.8)	49.13 (±7.5)	25 (4.6-39)
3 or more	20	70.9 (±15.08)	69 (±10.2)	30.8 (±12.1)	43.6 (±10)	9.37 (0-25)
P- value		.010	.06	.16	.005	.015
Mortality						
Yes	42	75.8 (±10.4)	73.2 (±11.6)	31.6 (±11.8)	46.8 (±8.5)	12.5 (0-25)
No	149	80.7 (±12.2)	77 (±11.9)	38.2 (±13.5)	50.1 (±7.5)	25 (12.5-37.5)
P- value		.02	.074	.004	.021	.003

*SD, standard deviation.
#IQR, interquartile range.

DISCUSSION

Patients on maintenance hemodialysis, a life-sustaining treatment for end-stage kidney disease, face numerous challenges and complications that can negatively affect their physical, emotional, and social well-being. This study was done to measure HRQOL in patients who underwent hemodialysis at our hospital in South India and to delineate the various factors that influence HRQOL. We also investigated if HRQOL could predict the risk of death among hemodialysis patients.

The mean HRQOL in our study across various subtypes is summarized in Table 2. Our patients showed higher scores in MCS than PCS. This may reveal the patient's ability to accept their disease and mentally adapt to their illness over time.

In a country like India, where the majority of patients are in the low-income group and stay in rural areas far from a hemodialysis center, additional factors like distance from the hemodialysis center and financial background should be taken into account while looking into the factors affecting QOL. Notably, these patients also have higher rates of morbidity as they often seek treatment late.

This was well exemplified in our study as 42.4% patients had no knowledge of their underlying kidney disease. Due to probable late presentation or delayed diagnosis, 40% of the patients had emergent start of dialysis, causing increased morbidity, mental stress, and financial drain in these patients.

Long distance to travel for dialysis, 3 times per week, is another very important factor which increases the stress among patients and caretakers (including increased financial burden). Of our patients, 28.7% must travel long distances (more than 15 km) to reach the hemodialysis center. While comparing HRQOL in these patients, patients who had to travel more had worse HRQOL scores, which was not statistically significant.

Among the other nonmedical factors, we found no significance in HRQOL scores between sex, annual income, payment modes, or educational status. However, we found that patients who were actively working had a better QOL as compared to patients who were retired or unemployed. Financial independence, better mobility, and less restriction in daily activity may have contributed to better QOL in these patients. This finding is consistent with other studies done in India by Sathvik BS et al,[8] and as well as in other countries like Taiwan.[9]

An Indian multicenter study done by Modi et al,[10] had studied the QOL in CKD patients. However, they had not included patients who were on hemodialysis. They, unlike our study, found that lower income and lower education were associated with negative scores across all subscales. Similar studies done

Table 5. Kidney Disease and Quality of Life 36™ Scores Association with Relevant Biochemical Parameters

Parameters	n	Symptom/ Problem of Kidney Disease Mean (SD*)	Effects of Kidney Disease Mean (SD*)	Physical Component Summary Mean (SD*)	Mental Component Summary Mean (SD*)	Burden of Kidney Disease (Median (IQR#)
Hemoglobin						
Hemoglobin <11 g/dL	141	79.2 (±11.90)	75.8 (±11.68)	36.2 (±13.25)	49.49 (±7.64)	25 (6.25 - 37.5)
Hemoglobin≥11.1 g/dL	50	84.5 (±10.8)	80.5 (±13.4)	40.2 (±14.2)	50.7 (±7.7)	37.5 (9.3-43.7)
P-value		.07	.18	.28	.53	.25
Ferritin						
<1000 mg/dL	120	77.7 (± 13.4)	76.8 (±11.3)	33.7 (±11.5)	48.2 (±10.2)	18.7 (0-32.8)
≥1000 mg/dL	41	79.1 (±12.1)	78.1 (±10.1)	39.7 (±15.2)	48.2 (±9.2)	21.8 (4.6-37.5)
P-value		.77	.75	.31	.98	.74
Phosphate						
≥5.5 mg/dL	118	80.8 (±11.4)	77.5 (±12.1)	38.1 (±13.6)	38.1(±7.4)	25 (6.2-37.5)
<5.5 mg/dL	46	77 (±12.9)	72.9 (±10.6)	33.4 (±11.9)	33.4 (±8.6)	25 (0-37.5)
P-value		.06	.02	.04	.45	.15
Albumin						
<4 mg/dL	138	78.2 (±12)	75 (±11.7)	35.2 (±13.1)	48.6 (±8)	25 (4.6-37.5)
≥4 mg/dL	53	86.4 (±9.3)	82.4 (±11)	43.9 (±12.2)	53.3 (±4.8)	37.5 (25-37.5)
P-value		.001	.002	.001	<.001	.001

*SD, standard deviation.
#IQR, interquartile range.

in India by Sathvik BS et al,[8] Sethi S et al,[11] and Manavalan et al[12] had found that women had a lower QOL as compared to men, which was not reflected in this study.

Among the medical factors, we found that patients with diabetes had worse QOL, and this was similar to studies done by Modi et al,[10] and by Mujais SK et al.[13] This worse QOL is probably due to additional comorbidities associated with diabetes.

Table 6. Odds Ratio of Death with Kidney Disease and Quality of Life 36™ Scores

KDQOL-36 Scores	Odds Ratio of Death (95% CI)	*P*-value
Symptom/problem of kidney disease	0.96 (0.93-0.99)	.024
Effects of kidney disease	0.97 (0.94-1)	.076
Burden of kidney disease	0.96 (0.94-0.98)	.003
Physical component summary	0.96 (0.93-0.98)	.008
Mental component summary	0.95 (0.91-0.99)	.024

KDQOL-36, Kidney Disease and Quality of Life 36™ questionnaire.

We found no relation between HRQOL and factors like frequency of hemodialysis (as long as they were regular), residual urine output, and type of AV access. A similar observation was made by Annes et al[14] and Sethi et al,[11] who did not find any difference in QOL scores between patients undergoing hemodialysis biweekly or thrice weekly.

However, non-compliant patients had a worse QOL, which was statistically significant. This is because these patients are not only noncompliant with dialysis alone but also with medications, diet, and fluid intake, resulting in more symptoms associated with inadequate dialysis and worse QOL scores. This group of patients had Kt/V below the target of 1.2.

We found that the duration of dialysis also played an important role in affecting QOL. We found that patients who were on dialysis for less than a year had a better QOL as compared to patients who were on dialysis for a longer duration. Routine hemodiafiltration is not done, as it is not affordable for most of our patients. This finding is similar to the study done by Sethi S et al.[11] However, Hallinen T et al[15] had a different observation in which QOL was similar during the 1st year of dialysis versus the later years of dialysis.

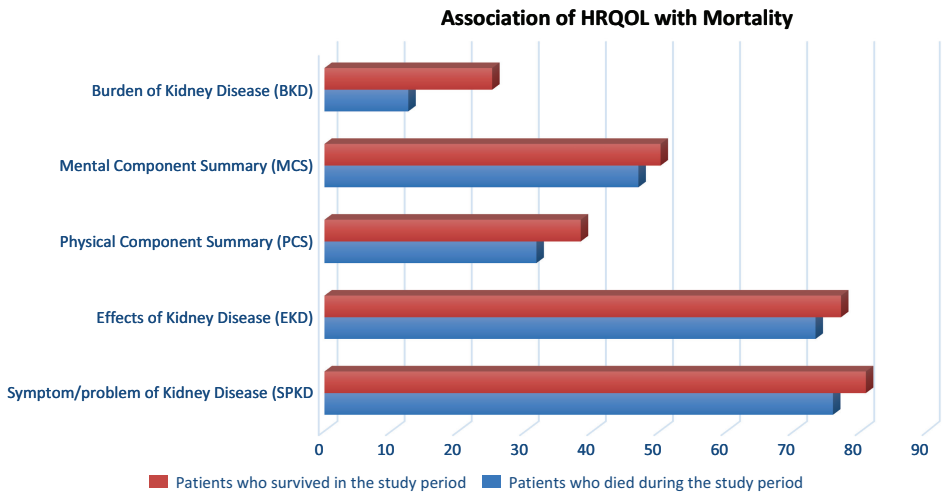

Figure 3. Association of Health-Related Quality of Life (HRQOL) with Mortality.

Patients who had cardiovascular comorbidities and a history of at least 1 hospitalization during the period of study did worse in terms of their QOL in this study.

Among the biochemical factors, we found that patients with low albumin had a lower QOL. This finding is consistent with other similar studies.[7,8] Albumin is widely used as a marker for poor nutrition and illness,[16] and the detection of hypoalbuminemia offers an opportunity to improve patient well-being.

Other biochemical parameters, like lower phosphate, were also associated with a lower QOL. However, there was no statistical difference associated with HRQOL and presence of anemia. This finding is in contrast to other studies.[7,12,17] This is probably because the mean hemoglobin in our study was 8.95 ± 1.60 g/dL, a level to which most of our patients would have gotten adjusted and therefore may not have symptoms.

Mortality rates among hemodialysis patients vary across different countries. According to the Dialysis Outcomes and Practice Patterns Study (DOPPS), which was a prospective, observational study of hemodialysis patients in France, Germany, Italy, Japan, Spain, the United Kingdom, and the United States, crude 1-year mortality rates were 6.6% in Japan, 15.6% in Europe, and 21.7% in the United States.[18] In this study, older age and comorbidities were associated with an increased risk of death (except for hypertension). In our study, the one-year mortality rate observed was 22%. The most common cause of death in the group of patients studied was cardiovascular events (52%), followed by infections (36%).

We found that patients who died during the period of study had a worse QOL as compared to patients who had survived, which was statistically significant (Figure 3).

In a study done in Kerala, South India, by Lakshminarayana et al,[19] they found that age >50 years, left ventricular hypertrophy, coronary artery disease, anemia requiring multiple transfusions, hypoalbuminemia (<3.6 g/dL), initial temporary vascular access, and duration on dialysis were shown to increase the risk of mortality. The most common causes of deaths, similar to our study, were cardiovascular events (51.5%), and infections (26.5%).

By univariate logistic regression, we found that the participants who had higher scores in KDQOL-36 had lower odds of death, which was statistically significant (Table 6). This is similar to the DOPPS,[18] where they concluded that lower scores of HRQOL (they had used the KDQOL-SF™ questionnaire) were strongly associated with a higher risk of death and hospitalization. This emphasizes the need to use HRQOL in our day-to-day practice so as to intervene early and decrease mortality.

A similar study[7] was done in our hospital 10 years ago in 2012, where we assessed the QOL in patients undergoing hemodialysis. We found that in comparison with the scores 10 years ago, there was a significant statistical difference in the MCS ($P < .001$). This probably reflects the improvement in the health-care delivery systems, socioeconomic environment, and support system.

The limitations of the study were that we had not assessed the HRQOL at repeated intervals through the study or after any interventions. Also, in this study, HRQOL was measured with the help of self-administered questionnaires that may be influenced by variations in the patients' attention, motivation, mood, and response biases such as social desirability, which can cause measurement error. However, we took maximum precaution to avoid assessing the HRQOL during periods of extreme stress, like any recent illness or family problems at home.

The present study gives an insight into the socioeconomic and medical factors associated with the QOL in CKD patients on hemodialysis from Bengaluru, South India. Our study underscores the need to assess the patient's QOL at regular intervals in the hemodialysis unit and the need to plan individualized interventions according to individual patient requirements, which in turn increases the patient's satisfaction and will improve dialysis compliance. We found that a patient's HRQOL can predict the risk of death; thus, early intervention can improve short- and long-term outcomes as well.

Ethics Committee Approval: Ethics approval was obtained from M. S. Ramaiah Medical College, Bangalore 560054, DRP/ IFP735/2021; Dated: October 9, 2021.

Informed Consent: Written informed consent was obtained from the patients who agreed to take part in the study.

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