Predictors of quality of life of hemodialysis patients in India

I. Veerappan, R. M. Arvind, V. Ilayabharthi[1]

Department of Nephrology, M S Ramaiah Memorial Hospital, Bengaluru, [1]Department of Biostatistics, National Institute of Epidemiology, Chennai, India

ABSTRACT

Little is known about the quality of life and survival in the patients on maintenance hemodialysis (HD) in India. Poor nutrition and dialysis noncompliance is common. This study investigates the factors that affect the quality of life (QoL) in HD patients in India. This cross-sectional study included 78 patients on HD for ≥ two months. Demographic, nutritional, functional subjective global assessment and Kidney Disease Quality of Life (KDQOL-36) assessments were done. Predictors of QoL were assessed by regression analysis. The mean calorie and protein intake were 1245 ± 116.9 kcal and 0.86 ± 0.19 g/kg/day respectively. Male gender (OR = 9.68), serum parathyroid hormone PTH <150 pg/ml (OR = 0.03), age ≤65 years (OR = 1.25), no catheter use (OR = 1.9) and hospitalizations (OR = 0.11), were independent predictors of total score ≥50. Independent predictors of physical component summary (PCS) >25 were male gender (OR = 5.06) and urine output at start of dialysis (OR = 1.05). Independent predictors of mental component summary (MCS) ≥25 were male gender (OR = 11.02), serum PTH > 150 pg/ml (OR = 0.15), daily protein intake of >0.8 g/kg and caloric intake >20 K.cal/kg (OR = 10.8). Patients with urine output >1 liter per day had more hypotensive episodes during dialysis (r = 0.56, *P* = 0.045), more headaches (r = 0.63, *P* = 0.006) but that did not affect the PCS significantly. Low PTH (<150 pg/ml) (OR = 1.29), multiple access failures (OR = 3.36) and total score ≤50 (OR = 0.09) were independently associated with increased hospitalization. Males, patients with serum PTH >150 pg/ml and those not on catheter had better total score. Though patients with higher urine output had better PCS, those with output >1 liter had higher incidence of hypotension and dialysis-related headache. Protein-energy malnutrition affected the MCS significantly. Dialysis noncompliance seen in one-fourth of the population did not affect the scores significantly.

Key words: Hemodialysis, kidney disease quality of life-36, malnutrition, noncompliance, quality of life

Introduction

The average incidence of chronic kidney disease Stage 5 (CKD5) in developing countries is 150 per million population, an incidence lower compared to the developed nations.[1] In India, an estimated 100-220 per million population reach CKD5 and approximately 10% of these patients receive renal replacement therapy mainly due to socioeconomic limitations.[2] The existing Chronic Kidney Disease Registry of India has 154 contributing centers as of 2008 and less than 50% of them contribute data regularly. It does not collect the morbidity, mortality and quality of life (QoL) data. Little is known about the QoL and survival in the patients on maintenance hemodialysis (HD).[3] Poor nutrition[4] and dialysis noncompliance is common. This study investigates the factors that affect the quality of life in HD patients.

Address for correspondence:
Dr. Ilangovan Veerappan, Assistant Professor, Department of Nephrology, Pondicherry Institute of Medical Sciences, Ganapathichettikulam, Village No. 20, Kalapet, Puducherry – 605 014, India.
E-mail: ilangovanv@gmail.com

Access this article online	
Quick Response Code:	Website: www.indianjnephrol.org
	DOI: 10.4103/0971-4065.91185

Materials and Methods

This was a cross-sectional study involving all the patients on HD for more than two months from a tertiary care hospital in Bengaluru. We excluded patients with recent history of severe sepsis requiring hospitalization, severe trauma, recent fracture and malignancy. Demographic information, co-morbidity index,[5] phosphate binder, vitamin D use; and calorie-protein intake was assessed by recall method and protein nitrogen appearance (PNA) respectively. The serum calcium (Sr. Ca), phosphorus (Sr. Pi), albumin (Sr. Alb) and PTH (Sr. PTH) were measured once pre-dialysis after either a long or short inter-dialytic interval. The PTH samples were handled with the standard precautions. Intact PTH was analyzed pre-dialysis using an immunology analyzer (Immulite 2000, Diagnostic Products Corporation, Los Angeles, CA, USA). The reference range was 12-65 pg/ml and interassay and intra-assay variation was 2.5% and 2.35% respectively. All patients were dialyzed with Fresenius F6 polysulfone dialyzer. The functional assessment and QoL assessment were done using subjective global assessment[6] (SGA) and Kidney Disease Quality of Life (KDQOL)-36[7] respectively.

The KDQOL-36 is a 36-item health-related quality outcome life survey with five subscales. The first 12 questions measure 'physical and mental functioning' with items about general health, activity limits, ability to accomplish desired tasks, depression and anxiety, energy level, and social activities; questions 13-16 measure the 'burden of kidney disease' with items about how much kidney disease interferes with daily life, takes up time, causes frustration, or makes the respondent feel like a burden; questions 17-28b measure the 'symptoms and problems' with items about 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; and items 29-36 measure the 'effects of kidney disease on daily life' with items about how bothered the respondent feels by fluid limits, diet restrictions, ability to work around the house or travel, feeling dependent on doctors and other medical staff, stress or worries, sex life, and personal appearance. Two patients completed the questionnaire themselves and the rest were helped to complete the questionnaire by the first two authors. Conscious effort was made to translate as such and not to make suggestions. The five subscales and total score were scored from 0-100 with higher the score better is the QoL using excel templates available free for download online (http://gim.med.ucla.edu/kdqol/).

Statistical methods

Data are presented as mean ± SD. The independent-samples T-test, Mann–Whitney U-test and analysis of variance were used as appropriate. Bonferroni correction was used to address the problem of multiple comparisons. Univariate regression analyses were used to identify predictors with P value <0.2 and those factors were included in logistic regression models. The dependent variables chosen were – total score > 50; physical component summary (PCS)≤25; and mental component summary (MCS) ≤25. P value of <0.05 was considered significant.

Results

Of the 131 patients studied [Figure 1], the mean age was 52.35 ± 13.53 years and 77% were males [Table 1] and the mean duration of dialysis was 14.3 ± 14.3 (median = 12, range 2-60) months. The commonest cause of CKD was diabetic nephropathy (53.4%). Final analysis included 91 patients as 24 did not give consent for the study and 16 patients were excluded after applying the exclusion criteria. The baseline parameters were comparable in the patient population that was studied and those that were excluded [Table 1]. For the QoL analysis 78 patients were eligible. Twenty four refused consent, 16 had atleast on exclusion criteria, two patients had severe dementia, five patients did not have a qualified medical translator and six patients did not complete the KDQOL-36 questionnaire [Figure 1].

The dialysis prescription was empiric and the frequency of dialysis varied between less than once weekly to thrice weekly (once weekly or less – eight, twice weekly – 80 and thrice weekly – 43 patients). Nineteen patients (24.4%) were noncompliant with regard to frequency or duration of dialysis. We defined noncompliance as skipping one or more HD sessions in a month or shortening by 10 or more min one or more HD sessions in a month. Over the period of three months six patients died, four left for another center and four had live related renal transplantation.

The mean calorie intake on a non-dialysis day was 1245 ± 116.9 kcal calculated by recall technique. The estimated daily protein intake was 0.86 ± 0.19 g/kg/day as calculated by PNA. The mean serum albumin was 3.52 ± 0.43 g/dl and 24.4% had serum albumin less than 3.5 g/dl [Table 1].

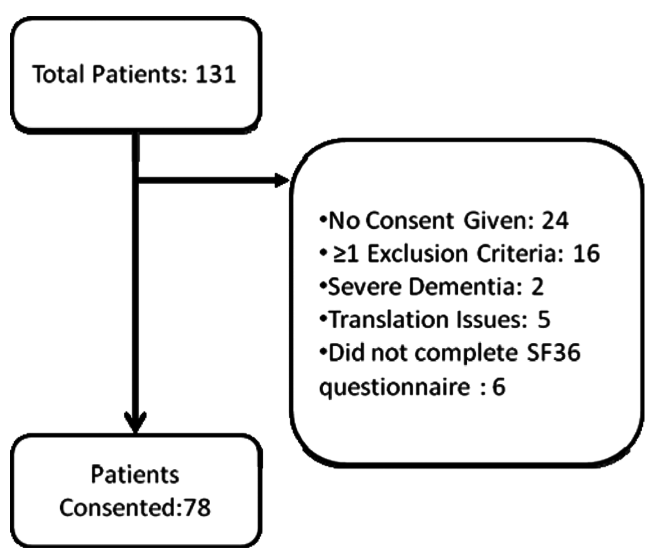

Figure 1: Patients included and excluded from analysis

Table 1: Demographics of all the patients

	All patients (n = 131)	Patients included (n = 78)	Patients excluded (n = 53)	*P*
Age (Years)	52.35 ± 13.53 (16 – 76)	55.3 ± 12.8	51.1 ± 13.8	NS
Sex (M/F)	101 (77%)/30 (23%)	62 (79.5%)/16 (20.5%)	39 (73.6%)/14 (26.4%)	NS
Diabetes mellitus (Pre-dialysis)	76 (58%)	46 (59%)	30 (56.6%)	NS
Diabetic nephropathy	70 (53.4%)	40 (57.1%)	30 (42.9%)	
PTH (pg/ml)	198.38 ± 181.6 (8.48 – 1067)	223.7 ± 185.6	187.9 ± 185.1	NS
Sr. calcium (mg/dl)	8.62 ± 0.67 (4.92 – 11.09)	8.6 ± 0.7	8.6 ± 0.8	NS
Sr. cal_{alb} (mg/dl)	9.09 ± 0.88 (5.4 – 12.09)	9.09 ± 0.8	9.08 ± 0.9	
Sr. phosphorus (mg/dl)	5.71 ± 1.82 (1 – 10.72)	6.0 ± 0.2	5.6 ± 1.8	NS
Sr. albumin (g/dl)	3.52 ± 0.43 (2 – 5.2)	3.5 ± 0.49	3.54 ± 0.55	NS
Calorie intake (Kcal/day)	NA	1245 ±116.9 (800 – 1750)	Not done	NA
PNA (g/kg/day)	NA	0.86 ± 0.19 (0.44 – 1.2)	Not done	NA
Phosphate binder use	107 (81.7%)	65 (83.3%)	42 (79. 2%)	NS
Vitamin D use	38 (29%)	22 (28.2%)	16 (30.1%)	NS
Kt/V (*n* = 103),†	1.31 ± 0.12 (0.53 – 1.8)	1.25 ± 0.2	1.31 ± 0.3	NS
Dialysis duration	14.37 ±14.3 (2 – 96)	15.1 ± 14.4	14.6 ± 13.1	NS
Dialysis noncompliance	NA	19 (24.4%)	Not done	NA
Hospitalizations (per year)	NA	1.33 ± 1.2 (0 – 4)	Not done	NA
PCS score	NA	36.29 ± 12.25 (19.3 – 75)	Not done	NA
MCS score	NA	33.29 ± 4.91 (18.2 – 50.3)	Not done	NA
SGA (A/B/C)	NA	17/112/2	Not done	NS

PNA = Protein nitrogen appearance; KT/V = Measure of dialysis adequacy; PCS Score = Physical component summary score; MCS Score = Mental component summary score; Cal_{alb} = Serum calcium corrected for serum albumin; SGA = Subjective global assessment. †KT/V was calculated for 103 patients. Of the remaining 28 patients, 20 were on irregular schedules and eight were on once weekly. NS = Not significant; NA = Not applicable

The mean serum calcium, corrected serum calcium (Sr. Cal_{alb}), phosphate and parathormone levels were 8.62 ± 0.67 mg/dl, 9.09 ± 0.88 mg/dl, 5.7 ± 1.82 mg/dl and 198.38 ± 185.2 pg/ml respectively [Table 1]. There were 15.3% patients with Sr. Cal_{alb} less than 8.4 mg/dl and seven patients (5.3%) had levels more than 10.4 mg/ dl. There were 47.3% patients with Sr. Pi ≥5.5 mg/dl. The phosphate binder and calcitriol were prescribed empirically—81.68% patients were on phosphate binder (calcium carbonate or caclium acetate) and 29% were on calcitriol. None of the patients included in the final analysis were on calcium-sparing phosphate binder.

The post-dialysis sample was taken from the arterial port after slowing the pump speed to 100 ml/min for 15-20 sec to minimize recirculation. Some of our patients had significant residual renal function as we included patients who were on dialysis for two months or more and hence their dialysis adequacy as measured by Kt/V was adjusted for residual renal function by urine collection if their urine output was more than 500 ml/day to avoid over-calculation of the delivered dose of dialysis, during the entire inter-dialytic period. For the eight patients who were on less than twice weekly dialysis the calculated weekly standard KT/V (stdKt/V) adjusted for residual renal function was 1.25 ±0.35. The mean Kt/V for the remaining 123 patients was 1.31 ± 0.12.

The mean annual hospitalization rate was 1.33 ± 1.2 and the average co-morbidty index was 0.83 ± 1.67. Of the six patients who died over the study period, two were in the group that was compliant with dialysis and four were from the dialysis noncompliance group.

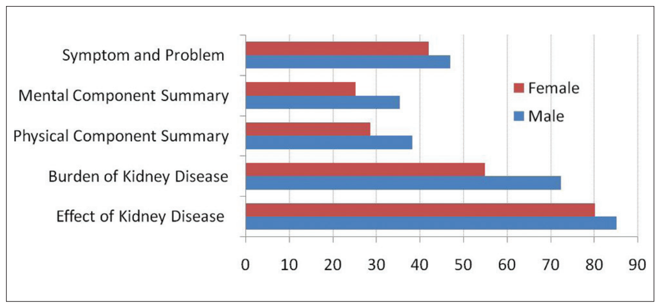

Figure 2: Gender difference in health-related quality of life scores (KDQOL-36)

The SGA score was A in 17, B in 112 and C in two patients. As per the KDQOL-36, the mean total score, PCS and MCS, were 53.73 ± 11.75, 36.29 ± 12.25 and 33.29 ± 4.91 respectively [Figure 2]. When the summary scores (PCS and MCS) and total scores were evaluated for different variables we observed that the following factors were associated with lower PCS and or MCS and or total score – female gender, age ≤65 years, urine output >1000 ml/ day, any hospitalization, lower hemoglobin, serum PTH <150 pg/ml, travel time <60 min, extremes of erythropoietin dose, catheter use, dialysis noncompliance and Inter-dialytic weight gain (IDWG) >5% [Table 2].

For total score, dialysis vintage, serum calcium corrected for serum albumin, urine output at initiation of HD, male gender, serum PTH >150 ng/ml, age ≤65 years, current catheter use, absence of hospital admissions, dialysis noncompliance, IDWG, serum albumin > 3.5g/dl, travel time to dialysis unit, blood transfusion in the last six months, presence of access failures and body weight identified by univariate regression analysis with *P* value <0.2 were included in multivariate regression analysis. By logistic regression male gender, PTH >150 ng/ml, age ≤65 years, current catheter use and absence of hospital admissions were identified as independent predictors of KDQOL SF-36 total score more than 50 [Table 3].

For PCS, dialysis vintage, serum calcium corrected for serum albumin, serum PTH >150 pg/ml, activated vitamin D use, nutrition intake with >20 Kcal/kg of calories and > 0.8 g/kg/day of protein, urine output at initiation of dialysis, absence of hospitalization, male gender, dialysis noncompliance, IDWG were identified by univariate analysis with *P* value <0.2 and were included in regression analysis. By logistic regression the independent predictors were male gender and higher urine output at initiation of dialysis [Table 4].

For MCS, serum albumin >3.5 g/dl, serum PTH >150 pg/ml, age <65 years, calorie intake, nutrition intake with

Table 2: Scores of the summary measures and total score of health-related quality of life by selected patient characteristics

n = 78	Physical component summary	Mental component summary	Total score
Clinical characteristics			
Age (years)			
>65 (ref)	25 ± 26.9	25.5 ± 6.2	43.7 ± 12.3
≤65	38.5 ± 22.3[a]	34.9 ± 9.2[c]	55.7 ± 10.6[c]
Gender			
Male (ref)	38.2 ± 23.7	35.3 ± 9.1	55.6 ± 11.8
Female	28.6 ± 18.6[a]	25.2 ± 5.3[c]	46.1 ± 8.3[b]
Kidney disease			
Diabetic nephropathy (ref)	33.2 ± 22.4	33.6 ± 8.9	52.1 ± 11.7
Unknown	35.6 ± 25	34.7 ± 10.1	55.7 ± 11.9
Chronic Glomerulonephritis	37.5 ± 12.2	24.6 ± 5	49.3 ± 7.8
Renal calculi disease	39.6 ± 27.6	26.2 ± 6.1	46.6 ± 5.1
Current urine output (ml)			
<1000 (ref)	40.2 ± 26.2	32.4 ± 10.4	55 ± 11.9
>1000	27.1 ± 8.5[a]	35.7 ± 5.8	55.6 ± 7.3
Hospitalization			
≥1	30.2 ± 24.3	32.9 ± 9.3	50.7 ± 13.1
Nil (ref)	42.4 ± 21.2[a]	33.7 ± 9.6	56.8 ± 9.4[a]
Nutrition			
PNA (g/day)			
≤0.8 (ref)	38.4 ± 21.8	35.1 ± 9.9	55.9 ± 11.6
>0.8	35.2 ± 26.5	33 ± 10	52.7 ± 12.9
Calorie intake (Kcal/kg/ day)	39.6 ± 26.6	34.6 ± 11.3	53.8 ± 13.3
<20 (ref)	39.4 ± 20.3	32.8 ± 9.7	56.2 ± 8.9
≥20			
Sr. Albumin (g/dl)			
< 3.5 (ref)	39.2 ± 25.9	32.8 ± 9.1	55.1 ± 10.6
≥3.5	35 ± 22.4	33.5 ± 9.6	53.2 ± 12.3
Blood biochemistry			
Hemoglobin (g/dl)			
< 8 (ref)	27.3 ± 18.6	35.1 ± 10.5	50.8 ± 12.2
8-11	38.4 ± 23 a	33.2 ± 8.2	54.7 ± 11.4
11-13	75 ± 5[c,*]	30.7 ± 14.4	80.5 ± 5.9[b]
Sr. PTH (pg/ml)			
>300	43.1 ± 26.7[c]	34.2 ± 10.5	56.6 ± 11.4[b,*]
150-300	42.4 ± 27.1	38.6 ± 9.2[c,*]	60.1 ± 12.7[c,*]
<150 (ref)	29 ± 17.1	30 ± 7.5	48.7 ± 9.3
Sr. calcium (mg/dl)			
<8	35.9 ± 26	33.4 ± 10.6	55.8 ± 13.4
8-10	36.2 ± 23.8	33.9 ± 9.4	53.6 ± 11.9
>10 (ref)	37.5 ± 19.4	27.3 ± 6.1	52.3 ± 9.8

Contd...

Table 2/- contd...

n = 78	Physical component summary	Mental component summary	Total score
Sr. phosphate (mg/dl)			
<5.5	39.3 ± 22	32.8 ± 9.7	54.6 ± 11.3
≥5.5 (ref)	33.6 ± 22	33.8 ± 9.2	52.9 ± 12.2
Dialysis-related			
Travel time (min)			
<30(ref)	37.5 ± 22	36.5 ± 9.7	56.1 ± 11.5
30-60	39.2 ± 28.5	32.2 ± 9.3	53.3 ± 13.2
>60	31.8 ± 19.8	30.3 ± 8.1[a,*]	51.1 ± 10.5
Dialysis vintage			
< 6 months (ref)	21.3 ± 16.8	31.2 ± 9.1	46.6 ± 10.4
6 months – 1 year	39.4 ± 26.6	34 ± 8.9	55.2 ± 13
1-2 years	38.6 ± 19.3[a]	34.7 ± 10.5	55.5 ± 11.3[a]
2-5 years	55 ± 21.4[c,*]	33.1 ± 8.9	61.2 ± 4.5[c,*]
EPO use (IU/week)			
Nil (ref)	31.3 ± 19.5	34.2 ± 4.4	53.1 ± 11.6
<5,000	42.9 ± 25.8[b]	34 ± 10.4	55.6 ± 12.9
5,000-10,000	45 ± 25.8[c]	28.3 ± 5.9	56.5 ± 9.9[c]
>10,000 (ref)	21.9 ± 14.6	31.2 ± 4.4	46.5 ± 9.7
Current catheter use			
No (ref)	37.1 ± 15.2	33.9 ± 9.3	54.3 ± 11.8
Yes	27.1 ± 14.1[a]	26.9 ± 8.4	47.3 ± 9.7
>1 Access failure			
No (ref)	32.4 ± 22	35 ± 10	52.8 ± 12.2
Yes	42.4 ± 24.8	30.6 ± 7.8[a]	55.3 ± 10.9
First dialysis with			
Catheter (ref)	36.1 ± 23.5	33 ± 9.2	53.3 ± 11.9
AVF	37.5 ± 25	36 ± 11	57.3 ± 10.8
Dialysis noncompliance			
No (ref)	43.5 ± 21.6	34.7 ± 9.8	57.3 ± 9.6
Yes	23.6 ± 21.4[c]	30.8 ± 8.1	47.4 ± 12.7[c]
Sp Kt/V			
≥1.2 (ref)	37.1 ± 24	33.1 ± 7.1	50.1 ± 11.1
<1.2	41.1 ± 24.2	34.7 ± 13	56.9 ± 9.8
IDWG (% body weight)			
<5 (ref)	42 ± 21.6	33.7 ± 9.4	56.7 ± 10.28
≥5	31.3 ± 24.1[a]	33 ± 9.5	51.1 ± 12.6[a]
Medications calcitriol			
No	38 ± 23.3	34.2 ± 8.7	54.5 ± 11.5
Yes	31.9 ± 23.7	30.8 ± 10.8	51.5 ± 12.3
Phosphate binder			
No	37.1 ± 25	32 ± 8.6	52.8 ± 12.2
Yes	35.6 ± 22.4	34.3 ± 10	54.4 ± 11.4

[a] = $P < 0.05 > 0.005$, [b] = $P < 0.005 > 0.001$, [c] = $P < 0.001$. * = $P < 0.05$ after Bonferroni correction ref = reference variable used in analysis; PNA = Protein Nitrogen Appearance; Sp Kt/V = Single Pool Kt/V; IDWG = Inter-Dialytic Weight Gain

>20 Kcal/kg of calories and >0.8 g/kg/day of protein, male gender, travel cost, urine output at initiation of dialysis, absence of hospitalization, dialysis noncompliance, IDWG were identified by univariate analysis with *P* value <0.2 and were included in regression analysis. By logistic regression analysis the independent predictors were male gender, serum PTH >150 pg/ml, nutrition intake with >20 Kcal/kg of calories and >0.8 g/kg/day of protein [Table 5].

Age >65, current urine output, body weight, IDWG, percentage of body weight, serum PTH < 150 pg/ ml, multiple access failure and total score >50 were found to be significantly associated with hospitalization by univariate regression analysis. In binary logistic regression, total score ≤50 (OR = 0.09), multiple access failures (OR = 3.36) and serum PTH <150 pg/ ml (OR = 1.29) were found to independently predict hospitalization [Table 6].

Discussion

There is limited information available on the QoL in Indian dialysis patients. QoL can predict hospitalization and mortality[8] and identifying modifiable factors in patients can improve their QoL and survival. Males had better TS, PCS and MCS consistent with other studies.[8] Age ≤65 yr, absence of catheter use, hospitalization and PTH >150 predicted better TS. Catheter use was associated with lower total score in our study consistent with DOPPS data.[9] Low PTH (<150 pg/ml) was a predictor of poor total score and PCS consistent with prior observations.[10] Data on association between low PTH and hospitalization is unclear with studies showing increased[11,12] and no association.[13] We observed no correlation of low PTH with nutritional parameters and the co-morbidity index. Earlier reports had shown that low PTH was associated with poor nutrition, higher co-morbidity index[14] and inflammation.[15] Only three patients in our study had a combination of calorie intake >25 Kcal/kg/day and protein >1.0 g/kg/day and this near universal malnutrition may explain why we observed no effect of nutrition on PTH.

Apart from male gender, only urine output at start of dialysis independently predicted better PCS. The patients with urine output >1L/day had more hypotension and headache during dialysis and were associated with poor PCS. However it was not an independent predictor of PCS. Hypotension is one of the common causes of dialysis headache.[22] Similarly, the CHOICE study has recently shown that though statistically not significant, 'physical functioning', 'role physical' and 'bodily pain' scores were

Table 3: Predictors of total score – KDQOL-36

	Odds ratio	Confidence interval	*P*
Age ≤ 65 years	1.25	1.11 – 1.89	0.027
Male gender	9.68	1.56 – 56.6	0.021
Dialysis duration	0.16	0.015 – 1.66	0.12
Serum PTH < 150 ng/ml	0.03	0.002 – 0.48	0.013
Current catheter use	1.9	1.23 – 2.1	0.002
Serum calcium (Alb)	0.80	0.21 – 3.05	0.74
Urine output_start	1.001	0.99 – 1.003	0.32
Hospitalization	0.11	0.012 – 1.019	0.05
Dialysis noncompliance	3.27	0.46 – 22.79	0.23
IDWG	0.67	0.35 – 1.27	0.22
Serum albumin > 3.5 mg/dl	2.33	0.42 – 12.96	0.33
Travel time	1.01	0.98 – 1.044	0.25
Transfusion requirement	0.77	0.58 – 1.039	0.08
Multiple access failures	4.53	0.45 – 45.20	0.19
Dry body weight	1.04	0.97 – 1.12	0.20

Serum calcium (Alb) = Serum calcium corrected for serum albumin; Urine output_start = Urine output at start of dialysis; IDWG = Inter-Dialytic Weight Gain

Table 4: Predictors of physical component summary

	Odds ratio	Confidence interval	*P*
Dialysis duration	0.32	0.07 – 1.37	0.13
Serum PTH < 150 pg/ml	0.99	0.24 – 4.07	0.99
Serum calcium (Alb)	1.02	0.42 – 2.51	0.95
Calcitriol use	1.72	0.35 – 8.33	0.49
Cal. PNA	3.86	0.54 – 27.44	0.17
Urine output_start	1.05	1.00 – 1.2	0.027
Any hospitalization	0.48	0.10 – 2.21	0.35
Male gender	5.06	2.04 – 32.48	0.008
Dialysis noncompliance	0.90	0.16 – 4.95	0.91
IDWG	0.73	0.50 – 1.07	0.11

Serum calcium (Alb) = Serum calcium corrected for serum albumin; Cal. PNA = Nutrition intake with at least >20 Kcal/Kg of calories and >0.8 g/kg of protein, Urine output_start = Urine output at start of dialysis; IDWG = Inter-Dialytic Weight Gain

Table 5: Predictors of mental component summary

	Odds ratio	Confidence interval	*P*
Hospitalization	0.34	0.06 – 1.93	0.22
Serum albumin > 3.5 mg/dl	1.71	0.21 – 13.5	0.61
Age ≤ 65	2.62	0.28 – 24.1	0.39
Calorie intake (Kcal/Kg/Day)	1.15	0.96 – 1.39	0.11
Cal. PNA	10.80	1.13 – 102.5	0.038
Male gender	11.02	1.04 – 116.6	0.046
Travel cost	0.99	0.99 – 1.0	0.057
Urine output_start	1.00	0.99 – 1.002	0.99
Dialysis noncompliance	1.32	0.19 – 9.09	0.77
Serum PTH < 150 ng/ml	0.15	0.02 – 0. 93	0.042

Cal. PNA = Nutrition intake with at least >20 Kcal/kg of calories and >0.8 g/kg of protein; Urine output_start = Urine output at start of dialysis

Table 6: Predictors of hospitalization

n = 78	Odds ratio	95% CI	*P*
Age > 65	NS	0.02, 1.11	0.06
Current urine output	NS	0.99, 1.0	0.56
PTH < 150 pg/ml	1.29	1.1, 2.3	0.046
Multiple access failure	3.36	1.88, 6.01	0.001
Body weight	NS	0.66, 1.01	0.11
IDWG, % of body weight	NS	0.82, 1.23	0.34
Total score > 50	0.09	0.02, 0.43	0.03

Age, serum PTH <150 pg/ml, current urine output, multiple access failures, lower body weight, IDWG >5 % of body weight, total score ≥50 with *P* value <0.2 by univariate analysis were included in the multivariate regression model poor in patients with urine output >250 ml/day at the end of one year.[17] Avoiding hypotension and cramps in these patients will increase the QoL and decrease the long-term complications of intradialytic hypotension in them.

Increasing IDWG was associated with poor PCS and total score and had no effect on the MCS. It has been reported that increased IDWG[18] is a risk factor for low QoL scores. Increased IDWG predisposes the patient to rapid and large-volume ultrafiltration with its associated intradialytic hypotension, cramps, dialysis-related headache,[19,20] interdialytic hypertension[21] and left ventricular hypertrophy.[22] Higher IDWG has been reported to be associated with better nutritional parameters and both improved[9] and decreased[23] survival. We found that IDWG had significant inverse correlation with calorie intake and , PNA, serum phosphorus, mid-arm circumference and had no significant correlation with serum albumin [Table 7]. This is contrary to other observations[32,30] where IDWG correlated directly with nutrition indices. There was no correlation of IDWG with age, co-morbidity index, hospitalization, serum albumin, serum PTH, serum calcium, Kt/V, noncompliance, intradialytic hypotension and cramps

Increasing hemoglobin improved the PCS in each of the groups examined. None of our patient had hemoglobin >13 g/dl. Our findings are consistent with the Normal Hematocrit Study that showed a similar significant improvement on the physical-functioning scale.[25] However the CHOIR study[26] and DOPPS[14] data showed no improvement in the QoL score between groups with <11 g/dl and >11 g/dl hemoglobin targets.

Male gender, serum PTH >150 pg/ml and nutrition intake with >20 Kcal/kg and >0.8 g/kg/day of protein intake were independently associated with higher MCS as has been reported in prior studies.[14] The mean protein intake by our cohort was 0.86 ± 0.19 g/kg per day evaluated by PNA and none of them had the recommended protein intake of 1.2 g/kg/day or higher. Our patients' protein intake was comparable to a study done on Indian CKD and hemodialysis patients by Tapiawala *et al.*[28] The correlation between protein intake and total calorie intake was poor and can be due various factors that include the fact that PNA reflects the nitrogen balance that is affected by factors like protein intake, protein anabolism and catabolism, biological value of the protein consumed and the percentage of protein in the diet. The typical Indian diet has low protein intake and most patients do not increase their protein intake after dialysis initiation.[8]

Table 7: Correlation between current urine output, IDMW, PNA, dialysis non compliance and intradialytic complications and related clinical and laboratory factors

	Correlation 'r'	*P*
Current urine output > 1.0 litre		
Intradialytic hypotension	0.56	0.045
Intradialytic headache	0.63	0.006
IDWG		
Calorie intake	–0.271	0.016
PNA	–0.249	0.028
Serum phosphorus	–0.234	0.04
Serum albumin	–0.014	0.9
Mid arm circumference	–0.458	<0.001
Current urine output	–0.466	<0.001
Comorbidity index	–0-099	0.389
Hospitalisation	0.195	0.088
Serum PTH	0.021	0.86
Serum calcium	0.253	0.025
Kt/V > 1.2	0.101	0.508
Noncompliance	0.097	0.398
Intradialytic hypotension	–0.244	0.031
Intradialytic headache	–0.183	0.108
Indradialytic cramps	–0.2	0.079
PNA		
Calorie intake	0.184	0.107
Serum phosphorus	0.27	0.017
Non compliance		
Urine output at dialysis initiation	0.368	0.001
Current urine output	0.181	0.113
Age	–0.111	0.335
Female gender	0.049	0.681
IDWG	0.097	0.398
Intradialytic headache, cramps, hypotension	–0.103	0.37

IDWG = Inter-dialytic weight gain as percentage of total body weight; PNA = Protein nitrogen appearance, PTH = Parathyroid hormone

Dialysis noncompliance was not a predictor of a poor total score, PCS or MCS or increased hospitalizations. When we analyzed the possible factors (age, gender, co-morbidity index, serum albumin, urine output at dialysis initiation, current urine output, intradialytic hypotension/cramps, angina, IDWG) associated with noncompliance, we found that only the 'urine output at initiation of dialysis' was significantly associated with noncompliance. The need to be compliant especially before their residual renal functions have declined significantly has to be emphasized in these patients to improve their QoL. The mortality increases by 30% and 11% with skipping one session of dialysis and shortening the dialysis session by 10 min or more per month respectively.[16] Though large observational studies have shown that the dialysis dose delivered is related to mortality, it is, however, controversial.[17] It is possible that dialysis noncompliance is associated with some unmeasured factors that influence mortality. Likewise, noncompliance was not a predictor of increased hospitalisations. Only multiple access failures, serum PTH <150 pg/ml and age >65 years were independently associated with hospitalization.

The mean age of our cohort was comparable to the Bengaluru,[27] and Chennai[29] studies and older to the Vellore[30] study. The low mean duration of dialysis in our study and other studies[27,29,30] from India is due to high attrition rate largely due to financial reasons. The dialysis prescription was empiric and not based on measures of dialysis adequacy and is a common practice in most centers in our country[27,31] and varied between less than twice weekly to thrice weekly. Renal replacement therapy remains unaffordable for the majority with only 10% of the patients continuing long-term renal replacement therapy.[32]

The mean serum calcium, phosphorus and PTH were comparable to previous study from India but significantly lower compared to the western population.[29] Lower dietary calcium[33,34] intake couple with a diet with high phytate content and higher vitamin D deficiency[35] atleast partly explains the low serum calcium. However, calcium balance studies in patients living in these conditions are not yet available.[36] Our cohort also had lower supplemental activated vitamin D intake (29% vs. 59.1% in DOPPS3).[37] All but 24 (18.3%) of the patients were on phosphate binders comparable to the use in the DOPPS. The use of phosphate binders and vitamin D analogues are also empirical in most patients and not based on serum PTH and calcium, phosphorus levels.

Conclusion

All the five subscales of KDQOL SF-36 were worse in females. Patients with serum PTH >150 pg/ml and not on catheter had a better total score. Though patients with higher urine output had better PCS, those with output >1 liter had higher incidence of hypotension and dialysis-related headache. Protein-energy malnutrition is rampant is our cohort and it affected the MCS significantly. Dialysis noncompliance seen in one-fourth of the population did not affect the scores significantly.

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How to cite this article: Veerappan I, Arvind RM, Ilayabharthi V. Predictors of quality of life of hemodialysis patients in India. Indian J Nephrol 2012;22:18-25.**Source of Support:** Nil, **Conflict of Interest:** None declared.