




Research Article

Quality of Life of End Stage Renal Disease Patients Undergoing Dialysis in Southern Part of Kerala, India: Financial Stability and Inter-dialysis Weight Gain as Key Determinants

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ABSTRACT

Background: Quality of Life (QoL) reflects the quality and outcome of healthcare along with key indicators of performance such as mortality and morbidity.

Objective: The aim of the study was to measure the QoL among patients with End Stage Renal Disease (ESRD) on maintenance hemodialysis and to understand various correlates of QoL.

Methods: A total of 95 ESRD patients from three dialysis centres in Southern districts of Kerala were interviewed. QoL was measured using vernacular version of World Health Organization Quality Of Life – Brief Version (WHOQOL-BREF) questionnaire.

Results: The mean age of the patients was 56.2 ± 13 years and 73.7% were males. Mean converted scores for overall QoL was 42.37 ± 21.3 and Health-related QoL (HRQoL) was 43.3 ± 18.3 , indicating poor QoL. Males had significantly higher physical domain scores ($p < 0.03$). Occupation, income and Socio-economic Status (SES) influenced overall HRQoL while better income and higher SES predicted better scores in psychological and environmental domains.

Conclusion: Patients with better control over inter-dialysis weight gain (≤ 1600 g) had significantly higher scores. This study highlights the importance of using QoL tools in assessing the QoL of patients and the factors contributing to it.

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1. INTRODUCTION

End Stage Renal Disease (ESRD) is the result of a progressive worsening of renal function over a period of months or years [1]. The global burden of ESRD grows at around 7% annually [2] and is a leading cause of death especially in developing countries [3] with limited resources for renal replacement therapy. Over 1 million people die of ESRD annually in these countries [4–7]. Diabetes and hypertension are the leading causes of ESRD [8–11]. Since India has a huge challenge with the rising burden of these two major risk factors, it has become an important public health problem in India [12,13]. The Indian state of Kerala is currently experiencing an epidemiological transition and has seen a huge jump in terms of per-capita out-of-pocket spending in health care in the recent

years [14]. National Family Health Survey data shows that chronic diseases account to a large proportion of morbidity and highest utilization rates for both out- and in-patient, services in the state compared to other states in the country [15].

Diabetes and its complications are draining the economy, impoverishing the affected population directly due to out of pocket expenses incurred and indirectly due to loss of productivity associated with the illness and treatment [16]. The chronic nature of the illness has serious impact on the Quality of Life (QoL) of patients as well as the caretakers [17].

With the growing recognition of the importance of ‘life quality’ besides longevity, there are attempts to use various tools to measure QoL related to various health conditions and the factors determining them. However, there have been only about 24 Indian studies on QoL among ESRD patients till now when a literature review was conducted, using appropriate key words- ‘renal dialysis’, ‘Peritoneal dialysis’, ‘Hemodialysis’, ‘end stage renal disease’ ‘ESRD’ and ‘quality

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of life. Among all these, there was only one study done in Kerala using the WHOQOL-BREF tool.

This study was therefore undertaken, with the following objectives:

1. To measure the overall QoL, Health-related Quality of Life (HRQoL) and domain specific QoL among ESRD patients.
2. To understand the key socio-demographic factors, illness and treatment-related factors affecting the QoL.

2. MATERIALS AND METHODS

We conducted a descriptive cross-sectional survey among patients from three dialysis centers— one each from Thiruvananthapuram, Kollam and Pathanamthitta districts in southern part of Kerala state. The first center is a tertiary care hospital; second hospital is a secondary care center while the third is a teaching hospital attached to medical college. We collected the data using a patient interview schedule and a translated version of World Health Organization Quality Of Life – Brief Version (WHOQOL-BREF) tool.

2.1. Sample

All patients aged 18 or above, undergoing hemodialysis in the first shift in these centers during the data collection period were enrolled in the study. Patients of non-Kerala origin, those who had a failed transplant and those who had apparent cerebrovascular disease or serious intellectual impairment were excluded from the study. Data was collected by trained health workers, over 1-month period per centerspread across 6-months in all three centers. All patients attending the dialysis unit during the data collection period were enrolled for the study, following the inclusion and exclusion criteria.

2.2. Tools

A pre-tested interview schedule was used to collect demographic and selected clinical parameters. The demographic parameters were age, gender, education, occupation, monthly income and family history of end state renal diseases. We used the 2014 version of Kuppaswamy's scale [18] to assess the Socio-economic Status (SES) and grouped them to upper, middle and lower socio-economic groups. We gathered the history and duration of diabetes, hypertension and dyslipidemia, and the duration since being diagnosed as renal failure.

Information on HRQoL was collected by interviewer administered WHOQOL-BREF questionnaire [19–21], which is an abbreviated version of the WHOQOL-100 tool. The tool was developed by the WHO for QoL assessment. It consists of 26 questions covering 24 facets and provides a profile of scores on four dimensions of QoL: physical health, psychological, social relationships and the environment. In addition, the tool has two global scores- one of overall QoL and another one on the overall satisfaction with health (HRQoL). The raw scores were transformed to a 0–100 scale to enable comparisons to be made between domains composed of unequal numbers of items. Higher scores reflect better QoL of the individuals.

We used the Malayalam translated version of the WHOQOL-BREF [21]. We tested the appropriateness, understandability and clarity of

words used among six patients. Two independent experts reviewed the suggestions and incorporated into the translation. After this, the tool was applied on another six patients to validate the clarity and appropriateness and then finalized.

The questionnaire demonstrated good internal consistency with Cronbach's alpha of 0.84 and Guttman's split half reliability of 0.9. The internal consistencies in the four domains of WHOQOL-BREF were as follows: Physical = 0.73, psychological = 0.65, social = 0.47 and environmental = 0.72.

2.3. Definitions Used

Compliance to dialysis was defined as not missing any dialysis session in the last 2 months preceding the data collection day. Compliance to Inter-Dialysis Weight Gain (IDWG) was defined as not gaining more than 3 kg weight between two dialysis sessions in the last 2 months preceding the data collection day. The cut-off of 3 kg was based on previous literature [22,23]. Out of pocket expenses in this study, was defined as the direct cost to the patient and was calculated as the sum of all deductibles, coinsurance, and copayments for covered services plus all costs for services that are not covered and included transport cost as reported, but did not include opportunity cost.

2.4. Ethical Consideration

Prior to the commencement of the study, approval was obtained from the Institutional Ethics Committees. We got the approval to use the translated WHOQOL-BREF tools from the researchers. Informed consent was obtained from all participants, who were assured full privacy and confidentiality when answering the survey questions.

2.5. Statistical Analysis

Data was entered in Epidata version 3.1 (EpiData Association, Denmark) [24]. Statistical analysis was performed using R Statistical software version 3.2.4 (R Core team, Austria) [25]. Mean and standard deviation were calculated to summarize the QoL scores for each domain, across the three centers. One-way ANOVA and Student's *t*-test were used to assess the relationship of scores with categorical variables. A *p*-value <0.05 was considered statistically significant.

3. RESULTS

This paper reports the findings from 95 patients. The mean age of the patients was 56.2 ± 13 years, 73.7% were males and 55.8% were un-employed (Table 1). Hypertension was reported by 85% patients, 62.1% had diabetes mellitus and 23.4% had dyslipidemia. The mean duration of hypertension was 9 years while that of diabetes was 16.5 years, indicating that a good proportion of the patients might have developed hypertension secondary to nephropathy. Around 13% patients had a family history of ESRD that required dialysis.

On an average, it has been 3 years since the patients in the study were diagnosed to have nephropathy (range: 1–40 years) and 2 years

to since they were classified as renal failure (range: 1–28 years). About 80% of the patients were on regular hemodialysis for more than 6 months (median 16 months, range: 0.5–131 months). 74.7% of patients reported that someone in the household had to accompany them for dialysis. Out of pocket monthly expenses ranged from INR2000 to INR50000 (with a median value of US\$296. Item wise break-up of expenses is given in Table 2. Please note that some patients had out-of-pocket expenses only on medicines, since the cost of injectable, dialysis and transportation were covered under the government-supported.

Out of 95 patients, 44 had two dialysis per week, 43 had three dialysis per week while eight had one dialysis per week. Almost all (98.9%) patients had full compliance to the dialysis schedules and 82.5% had full compliance to IDWG target. The median IDWG was 1600 g (range: 0–4500 g).

The mean converted scores for overall QoL was 42.37 ± 21.3 (median 50, range 0–100) and the mean converted scores for HRQoL was 43.3 ± 18.3 (median 50, range 0–100), both indicating poor QoL. The mean converted scores for the individual domains

Table 1 | Socio-demographic profile of the patients (N = 95)

Characteristics	N (%)
Sex	
Male	70 (73.7)
Female	25 (26.3)
Type of family	
Nuclear	78 (83.9)
Joint family	15 (16.1)
Marital status	
Married	88 (92.6)
Unmarried	5 (5.3)
Widowed	2 (2.1)
Education	
7 years or less of formal schooling	16 (18)
8–12 years of formal schooling	43 (48.3)
Graduates and above	30 (33.7)
Occupation	
Unemployed	53 (55.8)
Skilled/semi-skilled	29 (30.5)
Professionals	13 (13.7)
Income per month (INR; US\$ within brackets)	
≤ 5386 (<90)	29 (30.9)
5387–13,494 (90–225)	21 (22.3)
13,495–36,016 (225–600)	23 (24.5)
$\geq 36,017$ (>600)	21 (22.3)
Socio-economic status	
Upper socio-economic group	3 (3.4)
Middle socio-economic group	44 (49.4)
Lower socio-economic group	42 (47.2)

Table 2 | Reported expenses in the last month

Variables	Median (range) in INR
Oral medications	4000 (500–14400)
Injectable	3800 (0–18000)
Dialysis	6600 (0–28800)
Transportation	1440 (0–9600)

2018 rate, unadjusted for inflation.

Table 3 | QoL scores across centres and domains

Domains	Centre 1 (n = 24)	Centre 2 (n = 34)	Centre 3 (n = 37)	p
	Mean \pm SD	Mean \pm SD	Mean \pm SD	
Physical	47.7 \pm 16	39.4 \pm 12	43.2 \pm 8.7	0.041
Psychological	53.4 \pm 18.4	42 \pm 13.6	43.6 \pm 11.5	0.009
Social	53.8 \pm 24.9	43 \pm 18.2	46.2 \pm 12.5	0.087
Environmental	63.3 \pm 15.8	41.5 \pm 10.9	48.5 \pm 12	<0.001

were as follows: physical, 43 ± 12.4 (median 38, range 13–81); psychological, 45.5 ± 14.8 (median 44, range 19–81); social, 47 ± 18.6 (median 50, range 0–94); and environmental, 49.7 ± 15.2 (median 50, range 19–88). Table 3 compares the values between the centers. Except for Social domain, the three centers differed in terms of mean values of QoL scores.

Occupation, income and SES influenced overall HRQoL significantly. Patients with better Income and higher SES had better scores in psychological and environmental domains. Males had better scores in physical domain, while higher education groups had better scores in physical and environmental domains (Table 4). Overall HRQoL was poor among patients who were not diabetic probably due to early onset of disease and prolonged duration of dialysis. This is also reflected in poor scores with increase in number of months on dialysis. Table 5 summarizes the scores on all four domains and HRQoL with respect to various disease and dialysis-related factors. Inter-dialysis weight gain was found to significantly impact overall HRQoL and all the four domains.

Just as people with better income had better scores, people who were spending more money had better QoL across all the four domains, but not overall HRQoL. People who were not dependent on others to accompany them for dialysis had better scores, though the difference was not statistically significant.

4. DISCUSSION

Kidney disease is one of the growing causes of disability and death worldwide [26]. Increasing prevalence of diabetes and hypertension account for the high incidence of Chronic Kidney Disease (CKD) [27]. Many of the cardiovascular death occur in the background of CKD [28]. ESRD is a recognized public health problem worldwide [29] and the increasing prevalence of ESRD parallels the increasing prevalence of Type 2 Diabetes Mellitus and Hypertension with total number of people with diabetes projected to rise from 336 million in 2012 to 522 million in 2030 [30], with diabetic nephropathy emerging as the second highest cause of ESRD in South Asia [31].

Although successful renal transplantation with a well-matched kidney is the ideal solution, it is not easily attainable. The option between hemodialysis and peritoneal dialysis is biased toward hemodialysis worldwide except in few pockets where chronic ambulatory peritoneal dialysis is preferred over hemodialysis [32]. Initiation of hemodialysis at the optimal time and delivery of adequate dialysis and other supports offer a relatively good QoL [33]. In developing economies, limited availability of insurance cover and other logistic supports result in poorer QoL in spite of adequate dialysis [34]. In this connection, compliance of the patients to dietary, fluid and potassium restrictions are important [35]. Most patients/relatives

Table 4 | QoL scores and socio-demographic factors

	Physical	Psychological	Social	Environmental	HRQoL
Age groups					
24–45	42.8 ± 11.9	45.3 ± 15.2	48.5 ± 16.8	45.4 ± 11.2	36.8 ± 21.4
46–64	41.2 ± 10.5	46.5 ± 13.9	48.8 ± 16.0	49.3 ± 15.7	44.6 ± 19
65 above	44.9 ± 15.9	42.6 ± 15.2	42.7 ± 22.4	51.6 ± 15.5	44.9 ± 14.6
<i>p</i>	<i>0.514</i>	<i>0.554</i>	<i>0.376</i>	<i>0.421</i>	<i>0.285</i>
Sex					
Male	44.3 ± 13.2	45.1 ± 20.2	45.8 ± 20.2	50 ± 15.6	43.2 ± 18.7
Female	39.1 ± 8.7	50.5 ± 13	48.9 ± 14.1	48.9 ± 14.1	43.6 ± 17
<i>p</i>	<i>0.030</i>	<i>0.632</i>	<i>0.189</i>	<i>0.744</i>	<i>0.919</i>
Type of family					
Nuclear	42.6 ± 12.1	44.6 ± 15.1	46.6 ± 18	48.9 ± 15.4	43.7 ± 18.7
Joint	42.6 ± 13.6	49.2 ± 14.2	48.6 ± 23.1	53.1 ± 14.5	40.8 ± 17.9
<i>p</i>	<i>0.997</i>	<i>0.273</i>	<i>0.753</i>	<i>0.325</i>	<i>0.573</i>
Marital status					
Married	42.4 ± 11.8	45.2 ± 15.1	47 ± 18.5	49.7 ± 15.4	43 ± 18.6
Unmarried	46.6 ± 12.8	45.2 ± 6.5	41.2 ± 20.1	47.8 ± 10.4	42.6 ± 16.9
Widowed	59.5 ± 30.4	59.5 ± 13.4	62.5 ± 17.6	56.5 ± 17.6	56.5 ± 9.1
<i>p</i>	<i>0.126</i>	<i>0.411</i>	<i>0.397</i>	<i>0.791</i>	<i>0.595</i>
Education					
7 years or less of formal schooling	34 ± 10.6	39.1 ± 14.6	37.8 ± 16.2	41.6 ± 12.8	38.4 ± 17.9
8–12 years of formal schooling	44.1 ± 12.7	47.1 ± 14.4	48.9 ± 18.8	51.3 ± 14.4	43.7 ± 18.5
Graduates and above	45.9 ± 11.6	47.5 ± 15.1	49 ± 19.5	53.2 ± 16.2	45.6 ± 19
<i>p</i>	<i>0.005</i>	<i>0.135</i>	<i>0.101</i>	<i>0.036</i>	<i>0.458</i>
Occupation					
Unemployed	41.5 ± 13	43.4 ± 15.9	44.1 ± 20.9	47 ± 15.6	37.9 ± 19.3
Skilled/semi-skilled	45.9 ± 11.6	49.5 ± 12.5	53 ± 12.6	52.7 ± 12.1	49.6 ± 12.2
Professionals	44 ± 10.8	45.3 ± 14.4	45.6 ± 18.1	54 ± 18.1	51.5 ± 19.3
<i>p</i>	<i>0.238</i>	<i>0.208</i>	<i>0.111</i>	<i>0.145</i>	<i>0.004</i>
Income per month-INR (US\$)					
≤5386 (<90)	38.8 ± 11	40.7 ± 10.9	44.8 ± 16.8	41.3 ± 12.9	32 ± 19.6
5387–13,494 (90–225)	43 ± 11.5	45.9 ± 16.4	49.1 ± 16.7	51.7 ± 12.2	45.3 ± 15.4
13,495–36,016 (225–600)	42.7 ± 6.8	41.6 ± 10.5	42 ± 14.1	46.1 ± 9.5	46.9 ± 13.1
≥36,017 (>600)	47.1 ± 15.9	54.7 ± 17.7	52 ± 25	62.6 ± 16.8	52.5 ± 17.9
<i>p</i>	<i>0.112</i>	<i>0.004</i>	<i>0.283</i>	<i><0.001</i>	<i><0.001</i>
Socio-economic status					
Upper and Middle group	44.6 ± 11.7	49.7 ± 15.6	48.6 ± 20.6	54.5 ± 15.3	51 ± 17.6
Lower group	40.1 ± 11.8	40.8 ± 12.1	44.3 ± 16.2	44.3 ± 13.5	38.9 ± 18.2
<i>p</i>	<i>0.076</i>	<i>0.003</i>	<i>0.280</i>	<i>0.001</i>	<i>0.003</i>

Bold italicized *p*-values indicates significance.

fail to accept the concept of ‘opt out of dialysis’ when the condition has deteriorated beyond a stage of very poor QoL and dialysis helps only to prolong the life and associated sufferings.

We undertook this study to access the overall QoL, HRQoL and scoring in individual domains on a scale of 0–100 using WHOQOL-BREF tool. Any score <50 is considered ‘poor’. Our findings are in line with other studies highlighting SES, occupation and income as key determinants of QoL [36,37]. Even though dialysis adequacy is an important immediate factor which affects QoL, other factors are also important. The overall QoL, HRQoL and scores in individual domains were all below 50 on a scale of 0–100. SES, especially income and occupation were key determinants of QoL. Both sexes had the same quality in most domains studied. However, the males had better QoL in physical domains. These finding are in line with those reported in recent studies elsewhere including reviews [36,37]. Dialysis adequacy, even though an important immediate factor which affects the QoL, is determined by many other factors as this study results show.

We have found that patients with ESRD due to causes other than diabetes are having poorer QoL than their counterparts with diabetes. This can be explained by the earlier onset of non-diabetic causes. The dialysis vintage in non-diabetic ESRD patients was 35.35 months where as in diabetics, it was 18.09 months. However, non-diabetic ESRD patients on maintenance hemodialysis had poor QoL scores compared to diabetic possibly because of the difference in dialysis vintage. Patient compliance to diet, fluid and potassium restrictions and associated ischemic heart disease are important determinants of QoL and occurrence of sudden death. Fluid restriction is advised so as to restrict inter-dialysis weight gain (IDWG) to <3 kg. Patient compliance to fluid restriction can be assessed by IDWG. One of the important observations in our study was poorer QoL scores in patients with higher IDWG. This evidence opens up an opportunity for the health care worker to highlight the IDWG while counselling the patient.

In this study, the monthly median out of pocket expenditure for hemodialysis in 2018 was US\$ 296. This is much less compared

Table 5 | QoL scores and factors related to disease and dialysis

Variable	Physical	Psychological	Social	Environmental	HRQoL
Diabetes					
No	43.9 ± 15.3	47.8 ± 15.8	49 ± 19.9	47.2 ± 14.2	36.9 ± 20.6
Yes	42.4 ± 10.3	44.1 ± 14.2	45.8 ± 17.8	51.3 ± 15.6	47.2 ± 15.7
<i>p</i>	<i>0.615</i>	<i>0.250</i>	<i>0.440</i>	<i>0.196</i>	<i>0.012</i>
Dyslipidemia					
No	42.4 ± 13	45 ± 14.9	47.5 ± 19.1	49.5 ± 15.6	42.3 ± 19.3
Yes	44.5 ± 10.3	46 ± 14.3	44.9 ± 17.6	49.5 ± 13.6	46.2 ± 15
<i>p</i>	<i>0.451</i>	<i>0.781</i>	<i>0.607</i>	<i>0.451</i>	<i>0.33</i>
Hypertension					
No	51.1 ± 13.8	51.4 ± 15.7	53.5 ± 21.1	53.6 ± 16.7	55.5 ± 18.7
Yes	41.6 ± 11.6	44.5 ± 14.6	45.9 ± 18	49.1 ± 14.9	41.2 ± 17.5
<i>p</i>	<i>0.026</i>	<i>0.142</i>	<i>0.224</i>	<i>0.392</i>	<i>0.016</i>
Family history of ESRD					
No	43.1 ± 12.9	46.1 ± 14.6	46.2 ± 19.1	49.3 ± 14.4	41.5 ± 17.8
Yes	41.4 ± 9	42.5 ± 17.3	50.5 ± 15.8	52.4 ± 19.7	52.3 ± 19
<i>p</i>	<i>0.569</i>	<i>0.506</i>	<i>0.407</i>	<i>0.608</i>	<i>0.085</i>
Number of dialysis per week					
1	33.7 ± 13.6	38.5 ± 19.4	46.1 ± 27.8	44.7 ± 16.6	39.2 ± 19.3
2	44.6 ± 11.9	48 ± 14.7	46.6 ± 18.8	50.5 ± 14.5	45.1 ± 16
3	42.5 ± 12.1	43.9 ± 13.9	47.1 ± 16.5	49.3 ± 15.7	41.1 ± 20.4
<i>p</i>	<i>0.068</i>	<i>0.171</i>	<i>0.988</i>	<i>0.607</i>	<i>0.501</i>
Number of months on dialysis					
≤16	43.5 ± 12.4	45.8 ± 15.8	48.9 ± 20.6	52.2 ± 16.4	48.1 ± 17.2
>17	42.1 ± 12.7	45.4 ± 14.2	45.4 ± 18.1	48.9 ± 13.9	38.2 ± 19.9
<i>p</i>	<i>0.611</i>	<i>0.885</i>	<i>0.416</i>	<i>0.319</i>	<i>0.019</i>
Duration of diabetes (years)					
≤15	41.9 ± 8.3	46.3 ± 16.1	48.1 ± 18.4	55.3 ± 17	49.1 ± 15
>16	46.3 ± 10.7	46.8 ± 12.6	49.9 ± 15.2	55.7 ± 13.5	53.6 ± 9.4
<i>p</i>	<i>0.153</i>	<i>0.908</i>	<i>0.734</i>	<i>0.925</i>	<i>0.243</i>
Duration of hypertension (years)					
≤6	42.7 ± 9.4	45.4 ± 17.1	51 ± 20.7	54.1 ± 15.9	48.1 ± 18.2
>7	45.5 ± 14	48 ± 13.5	44.2 ± 16.2	54.6 ± 14.2	47.8 ± 9.9
<i>p</i>	<i>0.429</i>	<i>0.562</i>	<i>0.214</i>	<i>0.899</i>	<i>0.944</i>
Number of months since nephropathy diagnosis					
≤36	39 ± 8.7	42.3 ± 15.3	42.8 ± 20.6	43.3 ± 12.9	40 ± 18.3
>37	45.9 ± 15.9	48.2 ± 15.1	49.7 ± 18	55.2 ± 16.5	41 ± 20
<i>p</i>	<i>0.031</i>	<i>0.102</i>	<i>0.125</i>	<i>0.001</i>	<i>0.821</i>
Number of months since diagnosed as kidney failure					
≤24	42.4 ± 11.6	44.6 ± 15.6	47.4 ± 19.7	48.1 ± 16.7	44.1 ± 18.4
>25	44.2 ± 13.8	45.8 ± 14	47.8 ± 16.7	52.3 ± 13.1	42.6 ± 19.1
<i>p</i>	<i>0.519</i>	<i>0.706</i>	<i>0.915</i>	<i>0.188</i>	<i>0.697</i>
Average inter-dialysis weight gain (g)					
≤1600	44.3 ± 11.5	46 ± 14.9	50.5 ± 16.8	52.1 ± 15.5	47.4 ± 15.7
>1601	40.9 ± 13.5	45.1 ± 15.4	42.4 ± 20	47.2 ± 14.5	37.9 ± 20.6
<i>p</i>	<i>0.207</i>	<i>0.789</i>	<i>0.041</i>	<i>0.13</i>	<i>0.018</i>
Coming alone for dialysis					
No	42.1 ± 12	45 ± 15.5	46.5 ± 20.4	48.6 ± 14.8	41.5 ± 18.3
Yes	45.5 ± 14.6	48.4 ± 14.7	49.1 ± 15.1	54.7 ± 16.9	45.6 ± 20.6
<i>p</i>	<i>0.335</i>	<i>0.361</i>	<i>0.524</i>	<i>0.143</i>	<i>0.418</i>
Do any household members have to take leave to accompany					
No	43.8 ± 14	46.4 ± 15.7	47.4 ± 19.6	52 ± 15.4	42.5 ± 20.2
Yes	41.3 ± 9.7	44.6 ± 14.6	45.5 ± 17.9	45.8 ± 15.6	42.5 ± 16.1
<i>p</i>	<i>0.357</i>	<i>0.604</i>	<i>0.657</i>	<i>0.098</i>	<i>0.997</i>
Monthly average expenses					
≤12,740	38.9 ± 9.5	40.5 ± 11.1	41.3 ± 14.9	43.3 ± 11.6	40.6 ± 14.2
>12,741	46.8 ± 13.9	50.5 ± 16.8	51.8 ± 20.4	55.8 ± 15.8	45.2 ± 21.4
<i>p</i>	<i>0.001</i>	<i>0.001</i>	<i>0.005</i>	<i><0.001</i>	<i>0.220</i>

Bold italicized *p*-values indicates significance.

to the expenses reported by Umesh Khanna in private hospitals across India in 2005 (US\$ 358, at 2018 rate, after adjusted for inflation) [38]. Similarly, in a study, which compared the cost in various Asian countries, Li and Chow [39] reported a higher figure of US\$ 331 for India (as of 2018, adjusted for inflation). A private tertiary care teaching institution in central Kerala (2012) reported a higher cost of US\$ 806 (2018 rate) per month [40], while a public sector hospital (2017) reported an expenditure of US\$ 544 (2018 rate) per month [41].

Quality of life is increasingly used as a very important criterion in assessing the effectiveness of treatment for chronic diseases like ESRD [42–44] especially with increased longevity of these patients offered by renal replacement therapies [45]. Long-term hemodialysis also brings with it a lot of unpleasant fallouts like increased dependency on others [46] which, also affects the physical, psychological, socioeconomic, and environmental aspects of life negatively, leading to compromised QoL [47].

Patients, who undergo dialysis, have an uncertain life [48,49] with a lot of psychological and physiological stresses, including, but not limited to pain, restriction of fluids, limitations in physical activity, high cost of care, feelings of inadequacy, and negative moods [49–51]. These factors also affect the QoL by significantly interfering with both public and personal aspects of life [52–54].

5. CONCLUSION

This study from southern part of Kerala reveals poor overall QoL and HRQoL among ESRD patients. Patients in higher SES, those with better monthly income and better occupation and those who spend more on their treatment reported to have better QoL than the rest. Inter-dialysis weight gain, which reflects patient compliance and adherence to medical advice, was found to be a significant factor determining the QoL in this study. This is the first study from India to report on IDWG as a significant factor contributing to QoL.

Quality of life is an important factor for evaluating the quality and outcome of healthcare for ESRD patients along with key indicators of performance such as mortality and morbidity. More studies are required in Indian sub-continent in this regard. Specific QoL tool for chronic illnesses including ESRD patients is required for capturing disease specific factors and determining QoL in the given cultural context. Educating medical caregivers on the importance of using QoL tools in assessing the QoL of patients under their care should be emphasized to improve the dialysis prescription and QoL of patients undergoing long-term maintenance dialysis.

CONFLICTS OF INTEREST

The authors declare they have no conflicts of interest.

AUTHORS' CONTRIBUTION

KV and SFK study conceptualization, study supervision, and writing (review and editing) the manuscript. SFK and MA formal analysis. MA and JL data curation and writing (original draft). PM, PR,

RT, RA and JG data curation. JL and PR project administration. MP and KRN supervision of the project. All authors reviewed and edited the manuscript.

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