Quality of life of chronic renal patients in peritoneal dialysis and hemodialysis

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Abstract

Introduction: There are controversies regarding differences in quality of life (QOL) of chronic renal disease patients treated with different dialytic methods. **Objective:** To compare QOL among chronic renal disease patients in peritoneal dialysis (PD) and in hemodialysis (HD). **Methods:** Cross-sectional study in all the three centers of dialysis in Pelotas/Brazil. Patients in PD were interviewed after the monthly-routine-consultation and those in HD between the 1nd-2rd hours of the dialysis session by employing structured questionnaires. QOL was assessed with Short-Form Health Survey (SF-36). Means in the eight SF-36 domains were compared between groups. **Results:** Among 345 eligible patients (63 in PD and 282 in HD) 317 were interviewed (8% losses/refusals). About half of patients in both groups were in dialysis treatment for 3 years at most. There were more women in PD and more men in HD. Patients in PD reported less "pain" than those in HD (mean scores 76.5 and 64.3, respectively; p = 0.0040). There was no difference for the remaining SF-36 domains. Discussion: Utilization of HD in Pelotas is a bit lower than detected at the Brazilian Dialysis Census (2011), whereas the frequency of PD is similar to frequency observed in some European countries. The higher score on "pain" among patients in PD is consistent with findings from other studies although no difference and even additional advantages of PD over HD have already been reported. **Conclusion:** QOL is similar among patients in DP or in HD, except in terms of pain, that was less severe in PD patients.

Keywords: peritoneal dialysis; quality of life; renal dialysis.

Introduction

Chronic kidney disease (CKD) is now a major medical and public health problem in Brazil[1] and worldwide.[2] Treatment of this disease is carried out by means of renal replacement therapy (RRT) with peritoneal dialysis (PD), hemodialysis (HD) or kidney transplantation. In Brazil, the prevalence of patients on chronic dialysis increased from 24,000 in 1994 to about 100,000 in 2013.[3] The incidence of new patients on dialysis grows about 8% annually,[1] which carries a huge financial burden.[4]

Dialysis treatment, through either PD or HD, imposes a considerable psychosocial burden on patients and their families, which can be exacerbated by comorbidities.[5] Although early studies explore the more medical and technical aspects of dialysis, currently the psychosocial consequences have been further investigated, including quality of life (QOL) and patient satisfaction with treatment.[6]

Quality of life (QoL) is one of the major issues and challenges in healthcare. Much has been published about QoL, and many have been the attempts to find a better definition of the term under the most different perspectives, considering the science or the individual.[7] In 1994, the World Health Organization (WHO), defined QoL as "the individual's perception of his/her position in the family,

in the context of culture and value system in which he/she lives and in relation to his/her goals, expectations, standards and concerns."[8] As far as CKD patients are concerned, some authors reported worse QoL among chronic end-stage renal patients in pre-dialysis compared to the general population.[9,10] Comparing QoL in patients treated with PD or HD, several researchers found similar results with both methods.[11-16] Others reported HD being superior to PD,[17,18] as well as the opposite (PD over HD).[19-26]

Knowledge about QoL for patients under RRT enables the planning of specific interventions aimed at improving aspects involved in its determination. Thus, this study aimed to compare the QoL of patients on PD and HD in the city of Pelotas-RS, using the Short-Form Health Survey questionnaire (SF-36).[27] The hypothesis tested was that the QoL of patients on PD was similar or better than that of HD patients.

Method

We carried out a cross-sectional study of patients with end-stage CKD (ESRD) on PD and HD in Pelotas-RS, Brazil. The municipality of Pelotas, headquarters the 3rd Regional Healthcare Center of the State, it is a reference center for the treatment of chronic renal patients on RRT, serving the demand of 14 neighboring municipalities, some distant more than 150 km. The city has three RRT services, which offer both dialysis modalities (PD and HD), funded by the National Healthcare System and HMOs. We collected data from September 2013 through January 2014. The exclusion criteria were age below 18 years and inability to understand and/or answer the questionnaire.

We obtained the data using a questionnaire employed by previously trained interviewers (Medical and Nutrition students). For PD patients, the interviews were carried out in RRT centers, immediately after routine follow-up monthly review visits. HD patients were interviewed between the 1st and 2nd hour of dialysis sessions.

The outcome in QoL was assessed by the Portuguese version of the SF-36.[28] This questionnaire consists of 36 items divided into eight domains: physical functioning, disability due to physical aspects, pain, general health, vitality, social aspects, disability by emotional aspect and mental health. For each domain, we calculated a final score between 0-100, where zero corresponds to the worst QoL level and 100 - the best. In order to obtain the scores, the numerical values of each answer were initially recoded as recommended by the Brazilian Association of Self-Healing.[29] Later we used the formula below for each of the domains:

Domain = [(value obtained in the corresponding questions - lower limit)/variation (score range)] x 100

where the value assigned to the questions, the lower limit and the variation (score range) were extracted directly from the reference.[29] Since the domains evaluate different aspects of QoL, their scores are not added at the end and are assessed individually.

The exposure of interest was the current form of dialysis treatment. The two groups of patients had comparable QoL in the eight domains evaluated by the SF-36. The other independent variables investigated in the interview included demographic data (education, entering the labor market, city of residence, gender, age, race and marital status), smoking, and comorbidities (hypertension, *diabetes mellitus*, chronic hepatitis, heart failure, angina and chronic bronchitis). We recorded age in full years at the time of the interview and schooling was recorded in full years successfully completed. Marital status was categorized as with or without a spouse. As for smoking, individuals were classified as "never smokers", "former smokers" and "current smokers".

Information on the number of years on dialysis, whether or not the patient was seeing a nephrologist before starting dialysis, whether he/she could choose the type of dialysis and

had done any different type of dialysis or kidney transplantation, were investigated for all participants during the interview. From the patients' medical records we extracted information on hospitalizations in the past 12 months and results of biochemical tests in the month preceding the interview. The number of hospitalizations was coded into 0, 1 or ≥ 2. The laboratory tests carried out were: hematocrit (%); hemoglobin in g/dL; Urea in mg/dL; creatinine in mg/dL; potassium in mEq/L; calcium in mg/dL; phosphorus in mg/dL; AST in U/L and Kt/V. The latter was only available to patients on HD.

Quality control on the study was done by applying a brief questionnaire to about 10% of HD patients, due to their greater availability in the service, and response repeatability was evaluated using *Kappa* statistics. Data was double entered in Epidata 3.1 and analyzed in Stata 12.1. The two groups were initially compared regarding sociodemographic characteristics, smoking, comorbidities, time in dialysis, choice of dialysis method, hospitalizations in the past 12 months and results from laboratory tests. Later, we calculated and compared averages and standard deviations for each group in each of the SF-36 domains. Chi-square tests of heterogeneity and ANOVA variance analysis were employed in these analyses and the level of significance was set at < 0.05. As patients on PD and HD differed in terms of gender distribution and the analyses were further stratified according to this variable.

Since most PD patients came from the same service, to prevent the effect of unmeasured variables related to structural characteristics and healthcare process, additional analyses compared patients on PD and HD from this center only. Additionally, we compared only HD patients according to the dialysis department from where they came from.

The research project was approved by the three dialysis centers and by the Research Ethics Committee of the Medical School of the Federal University of Pelotas, through the Brazil Platform System (protocol number: 361.901). All the patients signed an informed consent form before the interview.

Results

Among 345 eligible patients (63 in PD and 282 in HD), there were 26 refusals (three patients on PD and 23 on HD) and two losses (one patient on HD that was transferred to another city and one death). The study included 317 individuals (60 on PD and 257 on HD). Most patients (81.1%) were in HD. One clinic alone concentrated 53 of the 60 patients on HD.

The *Kappa* statistical quality control showed a result of 0.84 to the question "choose the type of dialysis"; 0.79 to "consult with a nephrologist before starting dialysis treatment"; 0.72 for "trouble doing vigorous activities"; and 0.76 for "trouble doing moderate activities"; indicating good response repeatability.

Their average age was 57.7 ± 15.8 years (56.5 ± 15.3 and 57.9 ± 15.9 among patients on PD and HD, respectively; $p = 0.5$), and almost 50% were 60 years or older. Table 1 describes the patient population and the frequency of PD and HD according to sociodemographic traits, smoking, and comorbidities. Most were males (57.4%), Caucasians (63.1%) and lived with a marital partner (58.7%). About a quarter (24.2%) reported having completed nine years or more of study. Two-thirds of the subjects resided in Pelotas; 9.5% were smokers and currently about 8% were working. The most frequent comorbidity was blood hypertension, reported by 86.4% of the individuals; while chronic bronchitis was less frequent (approximately 8%). There were significant differences between the types of dialyses according to gender ($p < 0.0001$) and the presence of chronic hepatitis ($p = 0.014$). Among individuals on PD, just over a third (35%) were males, compared to almost two-thirds (62.7%) of those on HD. Of the 33 patients with chronic hepatitis, only one was on PD (Table 1).

Table 2 describes the history of dialysis and hospitalizations according to the current dialysis modality. About half of the patients in both modalities had been on dialysis for up to three years. More than half of PD patients reported

Table 1 Description of the study population, frequency, peritoneal dialysis and hemodialysis according to patient trait, Pelotas, 2014. (N = 317)

Traits	General		Peritoneal dialysis		Hemodialysis		*p**
	N	%	N	%	N	%	
Gender							< 0.0001
Male	182	57.4	21	35.0	161	62.7	
Female	135	42.6	39	65.0	96	37.3	
Age (years)							0.868
< 40	47	14.8	08	13.3	39	15.2	
40-59	113	35.7	23	38.3	90	35.0	
≥ 60	157	49.5	29	48.3	128	49.8	
Skin color							0.350
White	200	63.1	41	68.3	159	61.9	
Non-white	117	36.9	19	31.7	98	38.1	
Schooling (years)							0.269
0-4	127	41.5	30	50.9	97	39.3	
5-8	105	34.3	17	28.8	88	35.6	
≥ 9	74	24.2	12	20.3	62	25.1	
Marital status							0.817
Without a spouse	131	41.3	24	40.0	107	41.6	
With a spouse	186	58.7	36	60.0	150	58.4	
Smoking							0.217
Never smoked	157	49.5	35	58.3	122	47.5	
Former smoker	130	41.0	22	36.7	108	10.5	
Currently smokes	30	9.5	03	5.0	27	42.0	
City of residence							0.776
Pelotas	211	66.6	39	65.0	172	66.9	
Another city	106	33.4	21	35.0	85	33.1	
Currently employed	25	7.9	02	3.3	23	9.0	0.146
Comorbidity							
Arterial hypertension	274	86.4	55	91.7	219	85.2	0.189
Diabetes mellitus	102	32.2	22	36.7	80	31.1	0.408
Chronic hepatitis	33	10.4	01	1.7	32	12.5	0.014
Heart failure	61	19.2	10	16.7	51	19,8	0.574
Angina	33	10.4	07	11.7	26	10.1	0.723
Chronic bronchitis	25	7.9	02	3.3	23	9.0	0.146

The maximum number of information lost was 11 (3.5%) for schooling; **p* of the distribution difference regarding the type of dialysis according to patient trait.

that they could choose the current mode of dialysis, compared with 20.2% of those on HD ($p < 0.0001$). However, the doctor decided on the current type of dialysis for 54.2% and 83.5% of patients on PD and HD, respectively. More than half of the individuals on PD had been submitted to a different type of dialysis or a kidney transplant, compared to 10.1% on HD ($p < 0.0001$). PD patients had been more often hospitalized in the past 12 months than patients on HD had. The ratio of HD patients who had no hospitalization in the past 12 months was more than double when compared to that observed among PD patients (Table 2).

As for current biochemical parameters, Table 3 shows that PD patients had better mean values for hemoglobin, urea and potassium. The mean hemoglobin value for PD patients was 11.3 g/dL

Table 2 History of dialysis and hospitalizations, according to the current dialysis method, Pelotas, 2014. (N = 317)

Traits	Peritoneal dialysis		Hemodialysis		Value-*p*
	N	%	N	%	
In dialysis for how many years					0.327
≤ 1.0	12	20.0	81	31.5	
1.1-3.0	21	35.0	77	29.9	
3.1-6.0	15	25.0	49	19.1	
> 6.0	12	20.0	50	19.5	
Visited the nephrologist before starting dialysis	36	60.0	121	47.1	0.072
Can choose the type of dialysis	33	55.0	52	20.2	< 0.0001
Who chose the current dialysis method					< 0.0001
Physician	32	54.2	213	83.5	
The patient him/herself	20	33.9	40	15.7	
Family member	07	11.9	02	0.8	
Has been submitted to another type of dialysis or transplant	32	53.3	26	10.1	< 0.0001
Hospital stay in the past 12 months *					< 0.0001
0	16	26.7	140	54.5	
1	12	20.0	55	21.4	
≥ 2	32	53.3	62	24.1	

* According to medical records.

vs. 10.5 g/dL among those on HD ($p = 0.0006$). The mean urea and potassium values were lower in PD patients (109.7 mg/dL and 4.3 mEq/L compared with 127.3 mg/dl and 5.1 mEq/L) (Table 3). The median Kt/V among HD patients was 1.32 (1.26 for men and 1.49 for women).

According to frequency histograms, SF-36 domains showed relatively normal distribution, except for "mental health", which had a shift to the left. There was a statistically significant difference between the types of dialysis only for the "pain" domain (Table 4). PD patients reported less pain than in their HD counterparts (average scores of 76.5 ± 27.9 and 64.3 ± 29.8, respectively; $p = 0.0040$). Table 5 outlines the mean and standard deviation values of the SF-36 domains for each dialysis modality according to patient gender - the only demographic variable investigated which distribution was statistically different according to the type of dialysis. Men and women on HD differed in functioning, pain, vitality and mental health, and the scores in these domains were higher among men (Table 5). Women on PD reported less pain compared to those on HD ($p = 0.0016$).

Additional analyses comparing only those patients who used the service, which concentrated almost all PD patients, showed no difference between the two modes in any of the SF-36 domains. The comparison of HD patients only showed no difference among the three services.

Discussion

The main findings of this study were that the vast majority (81.1%) of patients on RRT are on HD and the QoL of those in PD, for the pain domain, is higher than that for patients on HD. For the other QoL domains, there was no statistical difference between the groups. Before discussing these findings in detail, we must stress the pros and cons of the current study. Among the disadvantages, first, the patients in the study were all in the same city, although Pelotas is a referral regional center for the State Health Secretariat; and although the results cannot be safely extrapolated to other locations, the findings are consistent with what has been reported in other international studies.[11,12,15,16]

Second, we did not collect information on the structure of services (such as the type of equipment

Table 3 Mean and standard deviation (SD) values of the laboratorial tests according to the current type of dialysis. Pelotas, 2014. (N = 317)

Laboratory tests	Peritoneal dialysis					Hemodialysis					*p*-value
	N	Mean	SD	Min.	Max.	N	Mean	SD	Min.	Max.	
Kt/V	-	-	-	-	-	257	1.45	0.6	0.55	5.3	
Hematocrit (%)	60	34.2	4.8	24.6	48.6	256	32.7	5.9	17.2	48.7	0.0555
Hemoglobin (g/dL)	60	11.3	1.5	8.3	15.4	257	10.5	1.9	5.3	16.0	0.0006
Urea (mg/dL)	60	109.7	36.4	42.0	200.0	257	127.3	38.6	34.0	300.0	0.0014
Creatinine (mg/dL)	60	7.9	3.9	2.1	22.5	256	8.3	3.5	2.4	21.1	0.3783
Potassium (mEq/L)	60	4.3	0.8	3.0	6.8	257	5.1	0.8	3.0	8.2	< 0.0001
Calcium (mg/dL)	60	9.8	1.2	6.7	11.8	257	9.7	1.1	6.5	13.1	0.5841
Phosphorus (mg/dL)	60	5.4	3.6	2.3	29.3	257	5.4	1.9	1.3	14.3	0.1561
TGP (U/L)	59	22.9	29.7	6.0	218.0	257	16.2	27.5	3.0	417.0	0.0960

Table 4 Mean and standard deviation (SD) values of the SF = 36 domains according to dialysis type. Pelotas, 2014. (N = 317)

SF-36 domains	Peritoneal dialysis					Hemodialysis					*p*-value
	N	Mean	sd	Min.	Max.	N	Mean	sd	Min.	Max.	
Functional capacity	60	51.3	27.8	0	100	257	53.5	29.7	0	100	0.6039
Disability by physical aspects	60	46.3	34.4	0	100	257	41.4	33.7	0	100	0.3216
Pain	60	76.5	27.9	0	100	257	64.3	29.8	0	100	0.0040
General health status	60	58.0	19.2	20	92	257	56.1	22.0	0	100	0.5369
Vitality	60	58.0	21.8	10	100	257	58.8	24.2	0	100	0.8071
Social aspects	60	66.3	28.6	0	100	257	68.9	29.0	0	100	0.5280
Disability by emotional aspects	60	49.4	37.6	0	100	257	53.2	40.2	0	100	0.5124
Mental health	60	71.7	20.4	12	100	257	68.7	22.6	0	100	0.3486

used, number of professionals involved and their qualification), patient care process (existence and adherence to management protocols, healthcare professional-patient relationship) or healthcare professional/patient satisfaction with the quality of care provided by the service. These features are known to be important for the quality of healthcare[30] and may have affected the QoL reported by the patients.

Thirdly, the number of PD patients in two of the services was greatly reduced, so that the QoL reported by PD patients almost exclusively reflects the aspects of a single service. To work around this limitation, we carried out a comparative analysis of the two dialyses modalities among users of this center only, and the results were similar to those obtained from the entire universe of patients.

Finally, the smaller population of PD patients analyzed may have influenced the lack of association observed in this group, when the genders were compared.

On the other hand, one of the advantages of the current study was the inclusion of all RRT patients in Pelotas, which ensures representation, avoiding selection bias. In addition, we applied standardized questionnaires that were previously tested in field conditions by trained interviewers. The SF-36 has been widely used in international studies[13,15,16,18,19,21,24-26] and had its construct validity confirmed in Brasil.[28] Moreover, the percentage of losses and refusals was low (8%), so that the results reflect local conditions.

Returning to the current study findings, the ratio of HD patients seen in Pelotas is slightly lower than

Table 5 Mean and standard deviation (SD) values of the SF-36 domain, according to the type of dialysis, stratified by gender, Pelotas, 2014. (N = 317)

SF-36 domains	Peritoneal dialysis					Hemodialysis						
	Females (n = 39)		Males (n = 21)		*p**	Females (n = 96)		Males (n = 161)		*p***	*p*#	*p*##
	Mean	sd	Mean	sd		Mean	sd	Mean	sd			
Functional capacity	49.4	27.2	55.0	29.2	0.4586	43.9	30.6	59.3	27.8	< 0.0001	0.3350	0.5121
Disability by physical aspects	49.4	35.1	40.5	33.0	0.3443	39.6	36.2	42.5	32.1	0.4958	0.1540	0.7820
Pain	74.9	27.7	79.5	28.6	0.5466	56.7	30.5	68.8	28.6	0.0015	0.0016	0.1074
General health status	58.7	20.1	56.6	17.9	0.6936	52.8	24.0	58.0	20.5	0.0628	0.1754	0.7640
Vitality	58.1	20.6	57.9	24.3	0.9706	53.7	25.6	61.9	22.9	0.0084	0.3441	0.4508
Social aspects	64.7	28.7	69.0	28.9	0.5824	66.1	32.1	70.5	27.0	0.2458	0.8129	0.8188
Disability by emotional aspects	44.4	37.7	58.7	36.4	0.1620	53.1	42.6	53.2	38.8	0.9871	0.2699	0.5377
Mental health	68.4	22.3	77.9	14.8	0.1733 ¶	63.9	24.7	71.6	20.7	0.0079	0.3273	0.1815

* Gender difference for patients on peritoneal dialysis; ** Gender difference for hemodialysis patients; # Difference between dialysis modalities for female patients; ## Difference between the types of dialysis for male patients; ¶ Non-parametric test (Kruskal Wallis).

that reported in the Brazilian 2011 Dialysis Census - which showed 90.6% of chronic renal patients on HD.[31] There are reports that in Mexico and Hong Kong the rate of chronic end-stage renal patients on PD is respectively 74%[32] and 80%;[33] in Europe, it ranges from 20% to 50%[34]; and in the United States, it is less than 10%.[35] It was only one clinic in Pelotas that had distribution similar to the pattern found in some European countries, with about 50% of patients on each dialysis modality. The differences between the ratios of treatment modalities are not well understood. Selection criteria, CKD etiology, training of medical and paramedical professionals, patient cognitive and educational levels, distance between patient residence and the dialysis center, age, comorbidity and government health policies, including financing and the compensation of professionals, are among the factors that may influence this disparity.

Most studies in the literature involving chronic renal patients assesses QoL for the same dialysis mode, and there is very little research comparing two or more methods. In addition, different instruments are used in the assessment of QoL, which limits comparison with the results of the current study. We found a Brazilian study that compared the APD with HD.[36] As for better QoL of PD patients compared to those on HD in the pain domain, the result is consistent with those of other studies that also used the SF-36.[19,25] But the findings have varied. Some studies found higher scores among PD patients in other domains of the SF-36;[19,21,24-26] while others did not detect any difference between the two groups;[13,15] and two studies reported HD to be better than PD in the following domains: "disabled by physical aspects"[18,36] and "mental health"[18] In the current study, the reason for PD patients to report less pain than those in HD is unclear. The stratified analysis by gender showed that this advantage was due to the difference between women of the two groups. It is possible that the decubitus - the body position required during HD - and the multiple venous punctures are contributing factors to the pain, but studies designed to specifically investigate this aspect must be carried out. Already the best scores in four of the eight domains of the SF-36 observed among men on HD, compared to women, may be related to psychosocial aspects of gender in our culture. We found no studies that have investigated differences in QoL between the genders, for individuals

undergoing the same type of dialysis that would allow the comparison of current findings.

We were concerned with the low ratios of patients who were able to choose the current mode of dialysis, particularly those on HD. In a cohort of 1621 patients on PD in the United States, 61% answered that the dialysis modality of choice had been discussed before the treatment.[37] However; only 11% chose to start immediately with PD, with greater adherence in the centers with better structure and experience in dialysis modality.

The history of hospitalizations in the past 12 months was higher among PD patients. Although there was no difference between the two groups regarding the prevalence of comorbidities, PD patients may require hospitalization for both treatment of specific complications (peritonitis),[38] as well as for management of comorbidities. Nevertheless, the QoL of these patients was not lower than that of HD patients. The previous experience of PD patients with other dialysis modality may be due to the management of emergencies. We must bear in mind that hospitalizations of PD patients include those for the placement of peritoneal catheter and, patients on HD, due to their close contact with the healthcare service, may have their problems promptly identified and managed, without the need for hospitalization.

PD patients had higher mean hemoglobin concentrations and lower serum levels of urea and potassium. Although both groups receive human erythropoietin, lower hemoglobin levels in patients on HD can be justified by hemodilution and small and repeated blood loss - inherent to the method, indicating that these patients may require higher doses of erythropoietin.[39] The higher levels of urea and potassium in HD patients may be due to the fact that sampling is only carried out before the dialysis - three times a week rather than daily, as is the case in PD. The mean Kt/V values obtained for HD patients are at levels recommended by the Kidney Disease Outcomes Quality Initiative (KDOQI) 2006.[40] For logistics reasons and to prevent hospitalizations specifically for this purpose, it was not possible to collect dialysis fluid samples for calculating Kt/V values among PD patients.

Conclusions

Similar to what happens in the rest of the country, there is a marked under-utilization of PD in Pelotas. Excluding some exceptional situations, such as loss of peritoneal function, adhesions that limit dialysate flow, uncorrectable mechanical defects (such as large abdominal hernias), lack of help in performing the technique when necessary and inflammatory bowel diseases,[41] PD and HD share the same clinical indications. The survival of PD patients is similar to that of HD patients;[42] and, according to some, in the first two years of treatment, the survival of PD patients is even higher than that of HD patients,[43] there is no justification for their low use. In addition, as evidenced in the current study, PD patients have less pain than their HD counterparts and similar scores in the other domains, which could explain its more widespread utilization.

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