

Quality of life, clinical outcome, personality and coping in chronic hemodialysis patients

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ABSTRACT

Rational: Our aim was to investigate the quality of life (QoL) in 103 patients undergoing chronic hemodialysis (HD) in an integrated assessment of clinical, personological, and adaptation parameters, also in a non-urban context.

Objectives: We collected data from all chronic HD patients attending four HD units. Clinical status was assessed by Kidney Disease Outcomes Quality Initiative (KDOQI) guidelines and by Age-adjusted Charlson Comorbidity Index (ACCI). Patients completed the following questionnaires: Kidney Disease Quality of Life Short Form (KDQOL-SF), Pittsburgh Sleep Quality Index (PSQI). Personality profile and coping style were assessed by Temperament and Character Inventory (TCI) revised and Coping Inventory for Stressful Situation (CISS). Data were analyzed by conventional descriptive statistics. Multiple forward stepwise linear regression analyses were performed.

Main findings: Variables significantly associated with physical and mental components of KDQOL-SF were: intact parathyroid hormone (iPTH) ($p = .004$; $p = .0015$), typology of cohabitant (family member or not) ($p = .022$; $p = .007$), years of dialysis ($p = .022$; $p = .048$). Variables associated with mental component of KDQOL-SF were: PSQI ($p = .000$), task-coping ($p = .000$), avoidance-coping ($p = .003$), work status ($p = .021$).

Principle conclusions: Our results suggest the importance of an integrated and multidirectional management of patients chronically undergoing HD and living in a non-urban context.

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Introduction

Chronic Kidney Disease (CKD) is a major medical and public health problem whose prevalence is increasing worldwide.¹ Patients progressing to end stage renal disease encounter several clinical issues² only partially corrected by Renal Replacement Therapy (RRT) and involve worse survival and QoL due to symptoms such as fatigue, bone pain, tiredness, itching, weight loss, nausea, loss of appetite.^{3,4}



Kidney transplantation is associated with better QoL,⁵ but the limited availability of organs and the frequent non-eligibility of patients implies that the kidney transplant is yet a niche RRT. Even peritoneal dialysis utilization is still very limited, due to unclear reasons.⁶

Hemodialysis (HD) ends to be worldwide the most employed RRT, involving nearly 90% of end-stage renal

disease (ESRD) population.⁷ This therapeutic option imposes a considerable burden on both patients and their families, which can be also worsened by several other complications.⁸ In fact, HD patients are more likely to develop cardiovascular, skeletal, endocrine, inflammatory, neoplastic,^{8,9} and psychological complications.¹⁰ Recent studies have demonstrated a relationship between psychosocial variables, QoL and mortality in RRT patients leading to a poor adherence to dialysis.¹¹

Sleep and mood disturbances are common among patients on dialysis and are significantly associated with worse survival and health-related QoL perceived.^{12,13}

QoL is one of the major challenges in healthcare. Much has been published about QoL, and many have

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been the attempts to find a better definition of the term under the most different perspectives.

Due to the difficult quantization of its components, QoL is still considered a hard topic with obvious validation problems. However, QoL remains an aspect of great interest considering its influence on clinical outcome and survival in chronically patients.¹⁴ Patients with CKD suffer from a disproportionate burden of morbidity and mortality both before and after chronic dialysis initiation. Caring of all aspects that may improve the QoL in HD patients is a fundamental task and, consequently, the evaluation of the QoL in patients requiring RRT has recently become a relevant area of investigation.^{3,14}

Several factors involved in chronic HD, such as lifestyle change, reliance on a machine for survival and the chronic disease itself, can lead patients who are psychologically and socially unstable to adopt reactive attitudes as depression, resignation, and anxiety.¹⁵

Personality traits can also affect health-related QoL (HRQoL) in different disorders, because it could determine patients' willingness to take treatment options, predispose to neuropsychiatric symptoms and affect coping strategies.^{16–18} Numerous deviations from normality in the personological profile of patients on HD have also been reported and supported by the evidence of specific alterations in neurohormonal levels in HD patients, according to different personological profiles.¹⁶ Moreover, sleep and mood disturbances are common among patients on dialysis and are significantly associated with worse survival and health-related QoL perceived.^{16,19} These psychological alterations inexorably lead to a reduced compliance to the treatment and an increase in hospital admissions.²⁰

A major challenge for clinicians is to develop strategies to better understand and improve physical and mental health in HD patients, considering all medical and psychological variables eventually linked to QoL perceived. Furthermore, there are limited data about the relationship of socio-demographic, psychosocial, and clinical variables that may be correlated with QoL in HD patients. In fact, several studies evaluated the QoL in patients on maintenance HD but an integrated assessment of clinical, personological, and adaptation ability parameters has never been approached so far.²¹ Moreover, the social context in which the HD patient lives could influence its strategies of adaptation to the chronic illness and dependence on a dialysis machine.²⁰

We hypothesized that clinical variables currently monitored in HD patients, comorbidities, sleep quality, and psychological variables (personality traits and coping strategies) could influence physical and mental

health perceived, identifying a population of patients at high risk for worse outcomes.

This cross-sectional, multicentric study is aimed at identifying predictors of functioning and well-being through the integrated assessment of all demographic, clinical, personological, and adaptation variables using several validated questionnaires in a sample of HD patients living in a suburban area.

Materials and methods

We designed an observational study by collecting data from resident patients in four HD units in the Catanzaro area ("Mater Domini" Hospital of Catanzaro, Pugliese-Ciaccio Hospital of Catanzaro, Catanzaro Lido Clinic, and Soverato Hospital) between January 2013 and June 2013.

The present study was performed according to the guidelines of good clinical practice in accordance with the Declaration of Helsinki and the Ethics Committee of the "Mater Domini" Hospital of Catanzaro (Italy) approved the protocol. A written informed consent was obtained from each patient before initiating any study related procedure. Inclusion criteria envisaged all end-stage renal disease (ESRD) patients older than 45 years (that achieved the adulthood) undergoing chronic HD treatment in stable clinical conditions and able to answer to questionnaires. Since current mean age in HD patients is quite advanced the exclusion of younger patients was aimed at the assessment of a more homogeneous and representative sample of the increasingly elderly chronic HD population. This choice was also aimed to avoid any bias related to young age-based psychological factors that might produce a distorted perception of QoL (e.g., immaturity, sentimental and sexual instability, work uncertainty). A standardized cognitive assessment was preliminarily conducted with the Mini Mental State Examination (MMSE).²² Patients having a psychiatric history were excluded too.

To assess the clinical status, the following data extracted from each patient medical record, were collected:

Sociodemographics—(gender, age, educational level, marital status, living condition, additional people in the household, work activity).

Clinical data—underlying nephropathy, years of HD, transplant list location, vascular access, erythropoietin (EPO) therapy, type of dialysis treatment, Kt/V (the variable for dialysis efficiency assessment) according to criteria of Kidney Disease Outcomes Quality Initiative (KDOQI) guidelines,²³ hemoglobin, ferritin, albumin, total protein, total cholesterol, triglycerides, C-Reactive Protein (CRP), intact Parathyroid Hormone (iPTH), serum calcium, serum phosphate. The laboratory variables included in the analysis are those currently monitored

by nephrologists in HD patients because refer to ESRD symptoms and are associated with worse outcomes.

Age-adjusted Charlson Comorbidity Index (ACCI)

Score—The most validated index of comorbidity including 17 categories of comorbid diseases. It is a weighted index based on the mortality-adjusted risk, estimated by a Cox proportional hazards model, associated with each disease, with additional points for age. This index is widely employed for estimating the prognosis in dialysis patients.²⁴

All patients were required to answer to the following questionnaires to assess QoL, coping strategies, personality, and quality of sleep (QoS):

Kidney Disease Quality of Life Short Form (KDQOL-SF)

—A self-reported questionnaire assessing both the functioning and well-being of patients with kidney disease and on dialysis, validated for the Italian language.²⁵ The questionnaire was administered in line with the Manual for Use and Scoring of the Kidney Disease Quality of Life—Short Form (KDQOL—SF 1.3). The questionnaire consists of generic and specific measures for patients with kidney disease. The generic part, used to construct the physical component summary (PCS) and mental component summary (MCS), is based on the SF-36 questions and comprised eight dimensions: physical functioning; role limitations as a result of physical health problems; pain; general health perceptions; emotional well-being; social functioning; fatigue/energy; current health status compared to the previous year. The specific part of KDQOL-SF instead consists of 43 items and explores 11 dimensions: symptom/problem list; effects of kidney disease on daily life; burden of kidney disease; work status; cognitive function; quality of social interactions; sexual function; sleep; social support; dialysis staff encouragement; and patient satisfaction. The scores on each dimension range from 0 to 100, with higher scores reflecting a better QoL.²⁵

The Coping Inventory for Stressful Situations (CISS)

—A self-48-items tool, validated for the Italian language, comprising three scales assessing Task-oriented, Emotion-oriented, and Avoidance-oriented coping. Additionally, the Avoidance scale consists of two separate subscales evaluating Distraction and Social coping. This tool provides a dimensional description of individual main strategies to cope with stress.²⁶ These strategies are essential for the adaptation to stressful life events, as it may occur in patients on HD.²⁷

Temperament and Character Inventory Revised (TCI-R)

—A self-administered questionnaire, whose 240 items are listed in random order and grouped into facets. It is based on the assumption that there are seven principal domains of personality, some of which are regarded as “temperament” (novelty seeking, harm avoidance,

reward dependence and persistence) and other as “character” (self-directedness, cooperativeness, and self-transcendence). This tool is the most validated instrument for the assessment of personality profile.^{28,29}

Pittsburgh Sleep Quality Index (PSQI)—A 19-items self-administered questionnaire that measures the sleep quality in the previous month by evaluation of seven sleep dimensions (each one scoring 0–3): subjective sleep quality; sleep latency; sleep duration; sleep efficiency; sleep disturbance; use of sleep medications; daytime dysfunction. The global PSQI is obtained by the sum of the seven scores. The threshold value for patients to be considered bad sleepers is 5. Lower values indicate a good QoS. This questionnaire has been extensively applied to HD patients for studying their known sleep disturbances.³⁰

Laboratory parameters and HD treatment efficiency criteria were related to recommendation from KDOQI guidelines.²³

Statistics were performed with the statistical software SPSS 18.0 (SPSS Inc., Chicago IL, USA). Data were first analyzed by means of descriptive statistics: means, standard deviations, frequencies, and percentages. Multiple forward stepwise linear regression analyses was subsequently performed to ascertain the independent predictors of PCS and MCS. The explanatory variables included in the model are reported in Table 1. According to Bendel and Afifi³¹, the significance level for variables entering the linear regression model was set at 0.2 and for removing from the model at 0.4. The level of statistical significance was set for values of $p < .05$.

Results

Seven out of the 110 patients approached did not meet the inclusion criteria; so only 103 were interviewed (response rate 91.5%). Table 2 shows the main demographic, socioeconomic, and clinical characteristics of the patients who completed the questionnaires.

Most patients were male (62.1%) and the average age was 66.2 years (51% of patients were in elderly age), 84.5% were retired. Only 10.7% of patients lived alone. About two thirds of the sample received no higher education level than primary school. The nephropathy responsible for ESRD was unknown in 57.3% of cases. Dialysis age was less than five years in 84.5% of patients and 18% of them was on a transplant waiting list.

Table 3 reports means and standard deviation of KDQOL-SF generic and specific dimensions, KDQOL-SF (kidney disease component summary), PCS and MCS; CISS dimensions; TCI-R domains; and PSQI score. Table 4 reports the linear regression models results.

As particularly noteworthy results, we found:

Table 1. Codification of variables included in linear regression models.

Variable	Codification
Gender	Male =1 Female =2
Age	45–55 = 1 55–64 = 2 65–74 = 3 >75 = 4
Typology of cohabitant	Family =0 Other =1
Working activity	Active worker =1 Retired =2
Age-adjusted Comorbidity Charlson Index (ACCI)	Continuous
Vascular access	FAV =0 CVC =1
Therapy with erythropoietin	Continuous
Dialysis vintage	Continuous
Dialysis efficacy (Kt/V)	>1.2 < 1.4 = 0 Other values =1 ^a
Hemoglobin (g/dL)	11–12 = 1 Other values =0
Phosphate (mg/dL)	3.5–5.5 = 1 Other values =0
Ferritin (ng/mL)	>100 = 1 <100 = 0
Albumin (g/dL)	>3.5 = 1 <3.5 = 0
Total protein (g/dL)	6–8 = 1 Other values =0
Cholesterol tot.(mg/dL)	<200 mg/dl =1 >200 mg/dl =0
Triglycerides (mg/dL)	<180 mg/dl =1 >180 mg/dl =0
C reactive protein (g/dL)	<3.16 = 1 >3.16 = 0
iPTH (pg/dL)	150–300 = 1 Other values =0
Calcium (mg/dL)	8.4–9.5 = 1 Other values =0
CISS-task	Continuous
CISS-emotion	Continuous
CISS-avoidance	Continuous
TCI-R novelty seeking	Continuous
TCI-R harm avoidance	Continuous
TCI-R reward dependence	Continuous
TCI-R persistence	Continuous
TCI-R self-directedness	Continuous
TCI-R cooperativeness	Continuous
TCI-R self-transcendence	Continuous
PSQI	≤5 = 1 >5 = 0

^aKDOQI, National Kidney F. 2006.

CISS: Coping Inventory for Stressful Situations; TCI-R: Temperament and Character Revised; PSQI: Pittsburgh Sleep Quality Index.

- Variables significantly associated with both, physical and MCS were: iPTH ($p = .004$ and $p = .0015$, respectively), typology of cohabitant (family member or not) ($p = .022$ and $p = .007$, respectively), years of dialysis ($p = .022$ and $p = .048$, respectively).
- Variable significantly associated with physical component summary alone was: ACCI ($p = .000$).
- Variables significantly associated with MCS alone were: PSQI ($p = .000$), CISS-task ($p = .000$), CISS-avoidance ($p = .003$), work status ($p = .021$), Harm Avoidance ($p = .001$) and Persistence ($p = .05$).

Table 2. Sample description ($N = 103$).

Characteristic	Fr	%
Gender		
Male	64	62.1
Female	39	37.9
Age groups (years)		
45–55	32	31.1
55–64	20	19.4
65–74	28	27.2
>75	23	22.3
Education level		
No formal education	3	2.9
Primary school	41	39.8
Secondary or higher school	59	57.3
Typology of cohabitant		
Family member	92	89.3
Other	11	10.7
Working activity		
Active worker	16	15.5
Retired	87	84.5
Base nephropathy		
Unknown	59	57.3
Glomerulonephritis	19	18.4
Polycystic kidney disease	11	10.7
Diabetic kidney disease	11	10.7
Other	3	2.9
Dialysis age		
>5 years	87	84.5
5–10 years	13	12.7
>10 years	3	2.8
Inclusion in transplant list		
No	67	65
Yes	36	35
Vascular access		
FAV	83	80.6
CVC	20	19.4
Erythropoietin		
No	22	21.4
Yes	81	78.6
Kt/V		
<1.2/1.4	87	84.5
other values	16	15.5
Hemoglobin		
11–12 g/dL	45	43.7
Out of range values	58	56.3
Phosphate		
3.5–5.5 mg/dL	66	64.1
Other values	37	35.9
Ferritin		
>100 mg/dL	25	24.3
<100 mg/dL	78	75.7
Total cholesterol		
<200 mg/dL	18	17.5
>200 mg/dL	85	82.5
HDL cholesterol		
>40 mg/dL	42	40.8
<40 mg/dL	61	59.2
LDL cholesterol		
<100 mg/dL	71	68.9
>100 mg/dL	32	31.1
Triglycerides		
<180 mg/dL	19	18.4
>180 mg/dL	84	81.6
iPTH		
150–300 pg/dL	78	75.7
Other values	25	24.3
Calcium corrected		
8.4–9.5 mg/dL	57	55.3
Other values	46	44.7

Table 3. Means and standard deviations of tests.

	Mean	SD
KDQOL-SF Specific dimensions		
Symptoms/problems	57.9	18.0
Effect of kidney disease	43.2	20.5
Burden of kidney disease	22.9	20.8
Work status	38.5	35.3
Cognitive function	70.0	23.1
Quality of social interaction	85.1	12.3
Sexual function	45.1	28.3
Sleep	58.4	15.8
Social support	67.4	24.8
Dialysis staff encouragement	85.3	15.4
Patient satisfaction	65.9	19.4
KDCS	55.8	10.3
KDQOL-SF generic dimension		
Physical functioning	42.2	26.9
Role physical	21.2	33.2
Bodily pain	54.5	24.0
Overall health rating	50.8	14.2
Emotional well-being	49.1	18.4
Role emotional	34.6	38.4
Role social	52.1	20.4
Energy/fatigue	43.5	18.5
PCS	35.2	8.3
MCS	38.5	9.0
CISS		
Task oriented coping	46.4	12.1
Emotion oriented coping	54.5	12.4
Social avoidance	18.1	19.7
Distraction avoidance	24.7	5.7
Avoidance oriented coping	54.5	9.6
TCI-R		
Novelty seeking	100.3	12.1
Harm avoidance	107.5	17.4
Reward dependence	94.0	13.2
Persistence	112.3	19.6
Self-directedness	123.1	19.2
Cooperativeness	118.4	19.5
PSQI-score		
Total PSQI	9.3	3.7

KDQOL-SF: Kidney Disease Quality of Life Short Form; KDCS: kidney disease component summary; PCS: physical component summary; MCS: mental component summary; CISS: Coping Inventory for Stressful Situations; TCI-R: Temperament and Character Revised; PSQI: Pittsburgh Sleep Quality Index.

Discussion

In our aged chronic HD population selected from a suburban area, the complete selection of personal parameters as personality, ability to adapt to stressful situations and clinical status are useful to predict patients' functioning in a chronic illness condition. Our results showed new significant predictors of QoL: working conditions, dialysis age, living conditions, task, and avoidance coping. iPTH was the only clinical parameter correlated to a worse QoL. Surprisingly, other relevant parameters for HD patients such as hemoglobin or serum phosphate, responsible for fatigue and itching respectively, were not found to be associated with a poorer QoL in our population. Symptomatic anemia and hyper-phosphatemia widely precede the entrance in HD because tend to appear when residual renal function is about 30% of normal.³²

The biologic profile could not reflect the overall physical and mental burden and we believe that the control of CKD treatment challenges blunted any correlation and emphasize the importance of a multidisciplinary team approach in order to achieve a better QoL in this population by individually controlling all these factors. Presumably, patients arrive to dialysis adapted to physical symptoms.³³

High serum phosphate levels predict iPTH increases leading to bone and cardiovascular impairment and need prompt correction² but not always serum phosphate lowering is followed by iPTH correction.³⁴ Furthermore, symptomatic bone involvement with pain appearance is tardive and typically reported after HD initiation.³⁵

Despite the vastness of information we obtained, some methodological issues need to be addressed prior to proceeding with the discussion. The limits consist of

Table 4. Linear regression models.

Model	Dependent variable	Independent variables	Coefficient	SE	<i>p</i> Values
1	PCS ($F = 6.723$; $p = .001$; $R^2 = 0.890$)	Tipology of convivent	-5.525	2.365	.022
		Age-adjusted Charlson index	-1.463	0.291	.000
		Dialysis age (years)	0.516	0.222	.022
		iPTH	4.861	1.660	.004
		PSQI	-3.897	2.111	.068
2	MCS ($F = 10.731$; $p = .001$; $R^2 = 0.512$)	Ferritin	2.944	1.718	.090
		Tipology of convivent	-5.910	2.149	.007
		Work status	-4.249	1.804	.02
		TCI-R harm avoidance	0.159	0.048	.001
		TCI-R persistence	-0.083	0.041	.05
		Dialysis age (years)	0.117	0.066	.05
		CISS-avoidance	0.226	0.074	.003
		CISS-task	0.312	0.061	.000
		iPTH	3.890	1.574	.002
		PSQI	6.615	1.827	.000
		Erythropoetin (dose needed)	2.818	1.689	.099
		Phosphate	-2.089	1.443	.151

p Values in bold, being <0.05, refer to each statistically significant association between variables.

PCS: physical component summary; MCS: mental component summary; TCI-R: Temperament and Character Revised; PSQI: Pittsburgh Sleep Quality Index.

the small sample size and the cross sectional procedure. Our sample can be considered representative of population of this specific suburban area in Southern Italy and includes all resident eligible patients in the four centers involved in the research, so a larger population could be assessed and long-term reevaluation could be performed to strengthen the statistical relevance.

QoL in chronic HD patients has recently become a topic of great interest, possibly due to both the increasing incidence and prevalence of patients on HD and the progressive aging of the HD population. Numerous interesting studies³⁶ have been recently conducted in order to understand the determinants of the poor QoL characterizing the patient on chronic HD. More recent data^{37,38} have been collected from patients referred to HD units in large metropolitan areas and never in homogeneous suburban contexts. Furthermore, clinical outcomes, QoL, personality, and ability to adapt to stressful situations have never been synchronously evaluated in chronic HD patients so far. In order to understand if all these issues are interdependent and mutually influenced, we explored them in our observational multicentric study patients living in a specific geographical area in Southern Italy. This study was conducted in an interdisciplinary approach combining the expertise of nephrologists and psychiatrists. The descriptive analysis shows that the specific dimensions of KDQOL-SF with the lowest mean score were burden of CDK. MCS score (mean 38.5) and PCS score (mean 35.2) were found to be lower than in other studies reported in literature.³⁹⁻⁴¹ We argue that our population was older but represents the current dialysis population. In accordance to Guerra-Guerrero study,⁴² we suppose that this result could be strictly influenced by the living condition and the difficulties that patients encounter to reach the HD unit in a suburban area. MCS score was higher than PCS in our patients similarly to other studies.⁴³ According to Braga et al.⁴⁴ reports, the difference between PCS and MCS scores was small. In both studies, the average number of years of dialysis was small suggesting that MCS is reduced at the beginning of dialysis and subsequently improves.

According to our results, multiple linear regression analysis showed that physical and mental health perceptive are strongly improved when are associated to iPTH normal values, identified in KDOQI guidelines range, longer dialysis age, and living in a family context.

The longer dialysis age, as a predictor to better QoL, appears actually surprising. This results could be partially confirmed by Braga et al.⁴⁴ who found that patients with chronic renal disease in the pre-dialysis stage had a poorer quality of life (QoF) and suffered from impaired cognitive functioning^{45,46} as compared

to patients with ESRD on regular dialysis treatment. It has been demonstrated that conventional dialysis improves various cognitive variables (e.g., memory, attention, concentration, and information processing) in comparison with pre-dialysis stage.^{45,47,48}

Thus, better cognitive performance, observed in our sample of dialyzed patients, as compared to previous studies on ESRD patients, occurs despite or because of a longer dialysis age. A similar surprising observation had been reported in the HEMO study population by Dwyer et al.⁴⁹

The result associate to iPTH good control and living in a family context appear interdependent because a supportive family can greatly improve the compliance to dialysis treatment, drug therapy, and diet.

A valid social support from family and friends has been reported as a crucial tool to enhance QoL by improving adherence to therapy and social relationships.⁵⁰ Looking at this result, in the extremely family-oriented social context, where our population lives, it appears even more significant.

Nevertheless, other studies did not find any relationship between iPTH levels and QoL⁵⁰⁻⁵² but there is no doubt that iPTH is an independent factor of morbidity and it could worse QoL. In fact, Tanaka et al.⁵³ showed how the iPTH has its uremic effect on multiple organs, leading even to central and peripheral neurotoxicity. Furthermore, Johansen and Chertow⁵⁴ found that hyperparathyroidism impairs health related QoL, causing bone damage and pain. An iPTH dysregulation could worsen QoL through its secondary effect on cardiovascular system.⁵³

The iPTH control only in part depends on HD treatment⁵⁵ and is more strictly associated with the compliance to oral therapy with agents interfering with iPTH increment (phosphate binders, calciomimetics, vitamin D analogues). Patients with a good compliance have presumably a better familiar environment and are motivated to respect home therapy. These aspects deserve close attention in the perspective of improving HD patients' outcome.⁵⁶

We also found that MCS is correlated to a good QoS and to the condition of active worker. Our finding on QoS confirms previous reports. Sleep quality is an important and determining factor to evaluate the QoL in HD patients. A poor sleep quality has been reported in more than 50% of HD patients.⁵⁷ Waking-up during the night and/or having breathing disorders during the sleep are common disturbances reported by 45-80% of HD patients. The loss of sleep correlates to both reduced physical and cognitive performances and is associated to a higher risk to develop anxiety and depression in patients undergoing chronic HD.⁵⁷

Consequently, a poor QoS might predict worse clinical outcomes in HD patients by increasing cardiovascular morbidity and mortality.⁵⁸

We found a strong correlation between mental health perception and work status found in our study, even if many patients of our population were over-65 year old. We believe that this result strongly emphasizes the importance of work status as a positive determinant of QoL. A job certainly has a positive influence on the perception that individuals have a role in society, greatly increasing the self-respect.

This perception is even stronger in our area, where people tend to keep active even after retirement, often by cultivating their own garden or taking care of grandchildren or dedicating to bricolage. Usually, patients that start HD is often considered unable to work, so we believe that much more attention should be paid to this important aspect of the life, also encouraging the development by government systems of special working channels for patients on chronic HD.

We also found a slight association between a better perception of mental health and a greater ability to adapt to stressful situations, in a task-oriented or avoidance-oriented coping behavior. This result introduces a novel concept and deserves a comment. "Coping" is defined as the cognitive and behavioral efforts to manage, reduce or tolerate external and internal demands and conflicts among them.⁵⁹ In HD, external demands are the various stressors associated with the treatment. The coping method works as a modulator of stressors. Patients' strategies to manage stressful situations could be linked to adapting to the illness condition. Our results show that coping in HD can be different, and it could suggest that the ability to use more than one modality of coping, also diversified, induces a better enhancement of coping and, therefore, an improved QoL.⁵⁹

Our results seem also to indicate that personality traits could influence the perception of mental health in HD patients. It is possible that persistence and harm avoidance can directly influence firstly the acceptance of the disease and adherence to the treatment regimen and, secondly, the mental well-being. Interestingly, higher values of persistence resulted associated with worse MCS. It could be related to the tendency to perfectionism, social and working good functioning of people with high persistence, that could be more difficult when they undergo chronic HD. To our knowledge, no studies that have considered these issues are available. Further studies seem necessary to confirm these early results.^{26,59}

In conclusion, according to our results, personality traits and coping strategies play a very important role

in adapting to HD and could affect the QoL perception. The assessment of physical, mental, and social well-being in HD patients is essential to develop personalized plans of care. In this perspective, the strategies in order to improve overall patient outcome are multiple.

We suggest that HD staff should pay much more attention to improving patients QoL and should develop multidirectional strategies: (a) to install a good communication with the patient's family; (b) to ensure a careful and periodical clinical monitoring of patients with special attention to the compliance to home therapy;⁶⁰⁻⁶² (c) to early recognize patient at risk of poor outcome, by means of complete medical and psychological assessment; (d) to care patient QoS; (e) to provide patients with transport service when needed; (f) to possibly encourage patients to keep work activity or, if retired, to collaborate at family life or to spend time in the dialysis unit; and (g) to give to patients an adequate personalized psychological support, especially before the dialysis initiation.

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