

The influence of emotional factors on the report of somatic symptoms in patients on chronic haemodialysis: the importance of anxiety

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ABSTRACT

Objective: To evaluate the presence of different somatic symptoms in patients undergoing chronic haemodialysis in comparison with a control group and to analyze the predictive capacity of some psychological variables (namely anxiety, depression, social support, self-efficacy and stress-coping strategies) on the reporting of these symptoms. **Method:** 46 patients undergoing dialysis treatment and 30 individuals without relevant illness matched in socio-demographics variables were evaluated with self-reported measures. Relationships between somatic symptoms and predictor variables were analysed through bivariate correlations and multiple regression analysis. **Results:** Patients showed values of somatic symptom much greater than controls, especially concerning immunological, cardiovascular, gastrointestinal and skin-allergy symptoms. Anxiety, with a positive association, is the main independent predictor of most of the symptom categories, explaining up to 24.9% ($p < 0.0001$) of variance in the total number of reported symptoms. Depression, level of worry, and passive coping-strategies (helplessness-hopelessness and fatalisms) were also associated with higher levels of somatic symptoms. Contrarily, the active coping strategy of fighting spirit, self-efficacy (coping capacity) and social support were associated with lower levels of symptoms. **Conclusions:** These results have clinical implications with respect to the aspects in which psychological interventions aimed to reduce somatic symptoms in chronic dialysis should be based and suggest that psychological-emotional variables could explain some of the symptom without clear aetiology in the renal patient.

Keywords: Chronic haemodialysis. Somatic symptoms. Anxiety. Depression. Self-efficacy. Social support. Coping Strategies.

Influencia de los factores emocionales sobre el informe de síntomas somáticos en pacientes en hemodiálisis crónica: relevancia de la ansiedad

RESUMEN

Objetivo: Evaluar la prevalencia de distintos tipos de síntomas somáticos en pacientes en hemodiálisis crónica en comparación con un grupo control y analizar la capacidad predictiva de algunas variables psicológicas (ansiedad, depresión, apoyo social, autoeficacia y estrategias de afrontamiento) sobre el informe de estos síntomas. **Método:** Cuarenta y seis pacientes en tratamiento con diálisis y 30 personas sin enfermedad relevante equiparadas en variables sociodemográficas fueron evaluadas mediante medidas de autoinforme. Las relaciones entre los síntomas somáticos y las variables consideradas como predictoras se analizaron mediante correlaciones bivariadas y análisis de regresión múltiple. **Resultados:** Los pacientes mostraron niveles de síntomas somáticos muy por encima de los valores obtenidos en el grupo control, especialmente en síntomas inmunológicos, cardiovasculares, gastrointestinales y piel-alergia. La ansiedad, con una asociación positiva, es el principal predictor independiente de la mayoría de las categorías de síntomas, llegando a explicar el 24,9 % ($p < 0,0001$) de la varianza en el total de síntomas informados. La depresión, el grado de preocupación y las estrategias de afrontamiento pasivo (indefensión-desesperanza y fatalismo) también se asociaron a mayores niveles de síntomas somáticos. Por el contrario, la estrategia de afrontamiento activo del espíritu de lucha, la autoeficacia (capacidad de afrontamiento) y el apoyo social se asociaron a menores niveles de síntomas. **Conclusiones:** Estos resultados tienen implicaciones clínicas respecto a los aspectos en los que debe orientarse la intervención psicológica destinada a mejorar la sintomatología en pacientes en hemodiálisis crónica y sugieren que las variables psicológico-emocionales pueden explicar algunos de los síntomas sin etiología clara en el enfermo renal.

Palabras clave: Hemodiálisis crónica. Síntomas somáticos. Ansiedad. Depresión. Autoeficacia. Apoyo social. Estrategias de afrontamiento.

INTRODUCTION

Stress and its associated psychosocial variables (life events, anxiety, depression, social support, coping strategies, etc.) are related to increased morbidity and mortality

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due to various diseases.¹⁻⁴ Many of these variables may be integrated in the dispositional factor called negative affectivity (the modern reformulation of the traditional concept of neuroticism), which can be defined as a general dimension of emotional distress and a predisposition to experience negative emotions (disgust, anxiety, sadness, hostility-anger, guilt, fear, depression, dissatisfaction with oneself, being more self-critical and having a negative bias in the assessment of oneself, the world and the future, etc.).^{2,3} These characteristics and their associated factors are predictors of a higher frequency of somatic complaints, the development of mental and physical illness, the use of health services, quality of life, life expectancy, a greater number of negative life events, poorer health habits, etc.^{1-3,5} States of stress and negative emotions (anxiety and depression) may intensify and worsen the course and progression of the disease, interfere with its treatment and modify the perception of symptoms, significantly increasing morbidity and mortality.^{1,4}

Several mediating mechanisms may explain the greater presence of symptoms in individuals with high negative affectivity: 1) The latter is associated with increased reactivity to stress factors on a cardiovascular, neuroendocrine and immunological level, leading to a greater probability of illness.^{1,6} 2) Individuals with high negative affectivity more frequently and more intensely perceive somatic symptoms. This may be due to an interaction of factors such as: greater attention to symptoms (hypervigilance or interoceptive “scanning”); a more negative interpretation of the latter, giving them more importance and exaggerating their significance (greater apprehension); they are more prone to complain about and overreact to symptoms, etc.² Lastly, the opposite may be true, that is, there may be a causal chain in which health problems make the individual more neurotic and anxious, thus increasing their negative affectivity.²

Advanced chronic kidney disease (CKD) is intrinsically linked to a considerable level of stress: uncertainty over survival, dependence on medical technology and dialysis sessions and what they entail (travelling, giving up other activities, etc.), which may come to be seen as a situation of dependence, as well as the stress inherent in dialysis sessions, severe dietary restrictions, the interference of the disease in adaptive functioning and on the quality of life,⁷ side effects of medication and severe physical deterioration,^{8,9} etc.

In haemodialysis patients the influence of psychological factors^{9,10} and their interaction with somatic symptoms¹¹ is well-known. For example, in a prospective 4 years follow-up study on haemodialysis patients it was found that patients who are highly neurotic (that is, who have higher negative affectivity) had a 38% higher mortality rate than those with low neuroticism, after controlling age, diabetes status, haemoglobin level, etc.¹² Within the concept of “illness behaviour” (which refers to the particular manner in which

a person responds to body signs and conditions in which they perceive these signs as abnormal), physical symptoms are a central element, both due to their importance and due to the multiple agents involved in them.¹³

In haemodialysis patients, most symptoms are explained by well-established aetiopathogenic mechanisms.¹⁴ Nevertheless, many suitably dialysed patients, with good haematocrit levels and good biochemical control continue to display “residual” physical discomfort that affects their well-being, for which no clear aetiology is found¹¹ and which do not respond suitably to the prescribed treatment.¹⁵ The importance ascribed to physical deterioration in kidney patients can be illustrated in the great proliferation of literature on health-related quality of life,^{7,16-18} which shows how kidney patients’ physical problems significantly modify their assessment of their condition and adaptive capacity. Within this context there are few studies that have analysed the prevalence of the different types of physical symptoms in haemodialysis patients, as well as the potential relevance of psychological-emotional factors in their determination.¹⁹ This may lead to an underestimation and inadequate treatment of these symptoms.

In this context, the contribution of health psychology can be relevant for a comprehensive haemodialysis patient care, identifying the psychosocial variables that may affect the reporting of somatic symptoms. In this study, we have focussed on anxiety, depression, social support, self-efficacy and coping strategies.

Anxiety and depression (central elements in the concept of negative affectivity) are common in kidney patients.¹⁰ Depression is expressed as a sad state of mind, loss of interest, anhedonia, feelings of guilt, low self-esteem, sleep disorders and appetite disorders, low energy, lack of concentration, etc. These problems may become chronic or recurrent and may lead to a substantial decrease in the individual’s capacity to take charge of their daily responsibilities.⁷ In kidney patients there is the particular issue that uraemic problems overlap with symptoms of depression, and as such, it is necessary to take extra care in its diagnosis, which must focus particularly on cognitive symptoms. Its aetiology has been associated with many losses and limitations that the patient must face¹⁰ and it is the main predictor of quality of life in this population.^{7,20} Depression has a prevalence of 20% to 30% in dialysis patients.²¹ With regard to anxiety, it is a negative emotional state evoked in situations that involve danger or threat. Anxiety is usually present in haemodialysis patients, given the continuous uncertainty surrounding the lives of these patients and the numerous situations that they have to deal with. Anxiety has been associated with a lower quality of life, it is higher in older patients and it increases in the first few months of haemodialysis.²² It has a prevalence of 27% in dialysis patients.⁹ These emotional disorders (depression/

anxiety) seem to be associated with a series of non-specific physical symptoms that significantly affect the well-being of the kidney patient¹² and they have demonstrated their capacity as independent predictors of survival.

Social support consists of the individual obtaining resources (material, cognitive and affective) from their interaction with other people or support “sources”. These resources reduce the perception of threat, negative emotional states and physiological responses to stress and they allow the patient to face stressful situations more effectively.^{6,18} Its protective effect in kidney patients has been demonstrated; it improves quality of life, adaptation to the disease, perception of symptoms associated with mental health problems, adherence to treatment and survival.^{9,18}

Self-efficacy is the belief that a person has about their degree of capacity to carry out actions that lead to the desired results being obtained.²³ In kidney patients it has been associated with decreased physical and psychological symptoms and adherence to treatment.²⁴

Coping refers to the usual strategies used by the individual to deal with stress and resolve daily problems.²⁵ Haemodialysis involves a process of continuous physical deterioration over several years,⁹ which creates feelings of limitation and despair in patients. The method of coping with these situations will determine the extent to which the disease will affect the patient’s life, adaptation and adjustment to the disease and the stress resulting from the demands that they must face. In haemodialysis patients, coping has a significant bearing

on adaptation to the disease and adherence to treatment.^{16,24}

The objectives of this study are: a) to assess the report of different types of somatic symptoms in haemodialysis patients, compared with a similar control group in terms of the main sociodemographic variables, and b) to explore the association and predictive capacity of some psychological variables (anxiety, depression, self-efficacy, social support and coping strategies) in the self-reporting of somatic symptoms, controlling, for this purpose, the effect of age and time on dialysis. The results of the study may be useful for understanding the symptoms that appear in patients, as well as for maximising potential psychological interventions intended to decrease symptoms in dialysis patients.

METHOD

Participants

The sample included 46 chronic haemodialysis patients. The type of dialysis received was online with three weekly sessions of four hours each (and one extra session for overweight patients). The sociodemographic and clinical characteristics of the sample are set out in Table 1. The inclusion criteria were: age equal to or younger than 60, being on dialysis treatment for more than six months, not recently having suffered (in the previous six months) serious clinical situations (extended hospitalisation, recent vascular access obstruction) and not suffering from psychiatric disorders or intellectual disabilities. These criteria were selected

Table 1. Sociodemographic and clinical characteristics of the sample used

VARIABLES	n	%	VARIABLES	N	%
Age (years)			Time on dialysis (years)		
20 to 29	1	2.17	0 to 5	24	52.17
30 to 39	8	17.39	6 to 10	9	19.56
40 to 49	25	54.33	11 to 20	9	19.56
≥ 50	12	26.08	≥ 21	4	8.69
Sex			CRF causes		
Male	33	71.73	Chronic glomerulonephritis	14	30.43
Female	13	28.26	Vascular	9	19.56
			Diabetes mellitus	6	13.04
Level of studies			Polycystic kidney disease	7	15.21
No studies	5	10.86	Pyelonephritis	6	13.04
Primary	28	60.86	Unknown origin	4	8.69
Secondary	7	15.21			
University	6	13.04	Transplant patient		
			No	31	67.39
			Yes	15	32.60

CRF: chronic renal failure.

to ensure an adequate understanding of the evaluation instruments used, a higher ability to maintain focus, and to reduce the possibility of the patient's clinical condition interfering with the results. This research was offered to all of the patients available in the health district (Haemodialysis Unit of the Hospital Médico Quirúrgico, the Santa Catalina Haemodialysis Centre, NefroLinares and the Playa de la Victoria Dialysis Centre) who met the inclusion criteria (58 patients). Of these, 46 (79.3%) decided to participate in the research. During the course of the study 5 patients (8.6%) had significant clinical situations and abandoned the study. The control group consisted of 30 participants without any significant physical illness, similar in age (45.33 ± 8.38 years), gender (7 females and 23 males) and educational level (4 without education, 18 with primary education, 4 with secondary education and 4 with university education) with the patient group.

Measuring instruments

We administered the following instruments:

Revised Somatic Symptom Scale (ESS-R).²⁶ This is a revised form of the previous 1987 version, designed to obtain an evaluation of physical health, corresponding to the most relevant somatophysiological systems. It contains 90 items with a Likert type 5 point response format (range from 0 to 4, with a higher score meaning more somatic symptoms), related to incidence of self-reported somatic symptoms within the last year, which are classified in accordance with the following subscales: General Immunological (tiredness, fatigue), Cardiovascular (palpitations, tachycardia, chest pain), Respiratory (wheezing, shortness of breath, sore throat), Gastrointestinal (stomach complaints, digestion problems, nausea), Neurosensory (dizziness, general weakness, abdominal pain), Skin-Allergy (itching, irritation), Musculoskeletal (presence of pain, cramp, contractures), Female reproductive (menstruation-related pain and discomfort) and Genitourinary (difficulty urinating, genital pain and discomfort). The last two subscales were eliminated from the study. The genitourinary category is related to urine excretion, which is intrinsically altered in CKD. The Female reproductive category is only applicable to fertile females. A total score was also obtained by adding all the symptoms reported together. As regards psychometric properties, it was found acceptable levels of internal consistency for each subscale (Cronbach's α coefficient ranged from 0.79 to 0.84) and high predictive validity in relation to other physical health indicators, such as self-reports of illnesses and external criteria such as clinical diagnoses.²⁶

Bárez Worry and Self-efficacy Scale (2002).²⁷ This scale was developed to analyse the beliefs that patients

have about their worries and abilities to manage certain situations in life, related to: illness, family, work, social activities and finance. It includes 25 items with a Likert type 4 point response format (range from 0 to 3, with a higher score meaning a higher degree of worry or self-efficacy). Patients obtained two types of score: one on the degree of worry due to different proposed situations and another with regard to the extent to which the individual feels capable of facing these situations (that is, the degree of self-efficacy). The internal consistency of the subscales ranged from 0.71 to 0.86.²⁸

Hospital Anxiety and Depression Scale (HADS): the Spanish version by Caro and Ibáñez²⁹. This scale assesses anxiety and depression levels without taking into account somatic symptoms, and as such, it limits the possibilities that the symptoms of the disease contribute to the scores. It includes 14 items with a Likert type 4 point response format (range from 0 to 3, with different response formulations. It has two subscales: one for anxiety (odd items) and another for depression (even items). The scale has a high internal consistency, with a Cronbach's α coefficient of 0.82 for the anxiety subscale and 0.84 for the depression subscale.

Social Support Scale (SS-25)³⁰. The objective of this scale is to quantify the availability of social support. Here, the patient indicates the level of support received. It has 25 items with a Likert type 4 point response format (range from 1 to 4, with a higher score meaning a higher degree of social support). The instrument's internal consistency according to Cronbach's α coefficient was 0.87.

Mental adjustment or Coping Strategies Scale.³¹ This scale assesses the extent to which the patient adjusts to their illness. It has frequently been used in cancer patients, and as such, for its adaptation to our sample we eliminated three of the instrument's items. It includes 38 items with a Likert type 4 point response format (range from 1 to 4, with a higher score meaning a higher degree of coping strategy). It has 4 subscales that assess the strategies of Fighting Spirit (active coping response, in which the patient wishes to fight against the illness with an optimistic mind-set), Anxious Worry (constantly worrying about the diagnosis and uncertainty over the control that they can exercise), Helplessness (despair, feeling of not being able to do anything) and Fatalism (they accept the diagnosis, but with fatalistic resignation). The internal consistency of the subscales ranged between 0.55 and 0.80.

Procedure

To select the patients, we contacted the dialysis centres in Jaén province (Haemodialysis Unit of the Hospital Médico Quirúrgico, the Santa Catalina Haemodialysis Centre, NefroLinares and the Playa de la Victoria Dialysis Centre).

Once the protocol had been approved by the centres' management, the nephrologists selected the patients who met the inclusion criteria. The study's objectives were explained to these patients and those who agreed to participate signed their informed consent. The collection of information with regard to the sociodemographic and clinical variables was carried out through an interview with the patient. They subsequently submitted a logbook with the questionnaires used in the study in accordance with a counterbalanced order. The data collection was carried out between April and July 2012.

Statistical analysis

The analysis of the potential differences in somatic symptoms between patient and control participants was carried out using the Student's t-test for independent samples. Analysis of the relationship between the variables considered predictive (anxiety, depression, coping strategy, social support, degree of worry and self-efficacy) and the variables defined as dependent (somatic symptoms) was carried out firstly by an exploratory bivariate analysis using Pearson's correlations. Secondly, we carried out a multiple regression analysis for each symptom category, in which we controlled the effect of the variables age and time on dialysis. This regression analysis was carried out in accordance with the stepwise method; predictive variables that showed significant associations with the dependent variable in the previous bivariate analysis were introduced. These regression analyses generated an r^2 value (adjusted in accordance with the number of degrees of freedom) as a rate of the model's predictive capacity and standardised β coefficients as the regression line slope value. The level

of significance was set at $P < .05$. The data were analysed with the statistical software SPSS 19.0.

RESULTS

Group differences for somatic symptoms

The means and standard deviations of the different somatic symptom categories appear in Table 2. The levels shown by patients were much higher than those obtained in the control group. The result of the mean comparisons was significant for all categories, except for Respiratory and Neurosensory. The greatest differences were observed in the Immunological, Cardiovascular, Gastrointestinal and Skin-Allergy categories.

Bivariate correlation analysis

Table 3 displays the correlations obtained for the somatic symptom categories and the psychosocial variables taken as predictors. The results show positive correlations between the different symptom categories and the measures of Anxiety, Depression, Degree of Worry and the coping strategies of Helplessness-Despair and Fatalism. Anxiety, and to a lesser extent, Depression, were the variables most associated with the different symptom categories, with significances of $P < .01$ in most correlations. We also obtained significant negative associations between some symptom categories and the coping strategies Fighting Spirit, Self-efficacy (that is, the degree of capacity to cope) and Social Support. The only symptom category that did not show an association with the psychosocial variables was Skin-Allergy.

Table 2. Means and standard deviations of the symptom categories

Somatic symptoms	Kidney disease group		Control group		Student's t-test	
	Mean	Standard deviation	Media	Standard deviation	t	Sig.
Immunological	10.76	6.27	5.30	3.37	4.36	0.000
Cardiovascular	10.78	7.68	4.90	6.62	3.43	0.001
Respiratory	8.52	8.04	7.66	6.16	0.495	0.622
Gastrointestinal	13.19	8.33	5.56	4.95	4.51	0.000
Neurosensory	11.78	8.32	8.50	5.81	1.87	0.064
Musculoskeletal	15.36	8.69	11.23	7.69	2.11	0.038
Skin-Allergy	12.30	7.66	6.13	4.65	3.95	0.000
Total symptoms	82.72	46.13	49.30	22.14	3.69	0.000

Means and standard deviations of the symptom categories evaluated using the Revised Somatic Symptom Scale (ESS-R) for the chronic kidney disease patient group and the control group. The table also includes the result of the mean comparison analyses for independent samples (t and P values).

Table 3. Correlation between the different somatic symptoms and psychosocial variables

	IG	CV	RS	GI	NS	ME	PA	TOTAL
Anxiety	0.430 ^b	0.493 ^b	0.520 ^b	0.333 ^a	0.443 ^b	0.656 ^b	0.257	0.538 ^b
Depression	0.319 ^a	0.412 ^b	0.421 ^b	0.227	0.333 ^a	0.472 ^b	0.209	0.410 ^b
Degree of Worry	0.249	0.204	0.176	0.316 ^a	0.236	0.419 ^b	0.155	0.303 ^a
Auto-efficacy Degree	-0.220	-0.102	-0.345 ^a	-0.071	-0.081	-0.262	-0.036	-0.190
Optimism	-0.147	-0.018	-0.064	-0.112	-0.108	-0.280	-0.167	-0.154
Social Support	-0.287	-0.242	-0.370 ^a	-0.137	-0.208	-0.291 ^a	-0.150	-0.286
Fighting Spirit	-0.362 ^a	-0.088	-0.294 ^a	-0.287	-0.143	-0.392 ^b	-0.288	-0.315 ^a
Helplessness-Despair	0.246	0.145	0.147	0.154	0.294 ^a	0.390 ^b	0.156	0.264
Fatalism	0.181	0.127	0.190	0.019	0.310 ^a	0.392 ^b	0.208	0.247
Anxious worrying	-0.069	-0.043	0.050	-0.041	0.127	0.046	-0.119	-0.022

CV: Cardiovascular, GI: Gastrointestinal, IG: General Immunological, MS: Musculoskeletal, NS: Neurosensory, SA: Skin-Allergy, RS: Respiratory.

TOTAL = sum of all symptoms reported.

^a $P < .5$, ^b $P < .01$.

Multivariate regression analysis

The results of the multiple regression analysis for the prediction of somatic symptoms, once the effects of age and time on dialysis had been controlled (none of these variables were significantly associated with the report of symptoms) are displayed in Table 4. As can be observed, only regression models composed of one variable were obtained and in all cases, this variable was Anxiety. As such, greater Anxiety significantly predicts an increase in auto-informed Musculoskeletal, Respiratory, Cardiovascular, Immunological, Neurosensory and Gastrointestinal somatic symptoms, as well as the total symptoms reported. With the exception of Gastrointestinal symptoms ($P=.027$), the magnitude of these associations is quite high, with significance levels below 0.003. Once the effect of Anxiety was statistically controlled in the abovementioned first regression models (and therefore, the withdrawal of shared variance between Anxiety and the rest of the variables taken as predictors), there was no second regression model capable of significantly increasing the predictive capacity of Anxiety by itself. Therefore, the predictive capacity of the remaining psychosocial variables that showed significant associations in the bivariate correlation analysis was lost.

DISCUSSION

Our first objective was to know the somatic symptoms most commonly reported by kidney patients on treatment with dialysis, in comparison with the control group that was matched in terms of sociodemographic variables. With the exception of respiratory symptoms, all the other categories of symptoms assessed with ESS-R had much higher scores in kidney patients compared to the control group. The differences

were particularly marked (and were more than twice as high) in the Gastrointestinal, Immunological, Cardiovascular and Skin-Allergy categories. These symptoms may be explained in part by the long-term effect of anaemia, malnutrition and cardiovascular complications typical of kidney disease,³² which entail frequent complaints of a lack of energy, musculoskeletal deterioration, lack of motivation and fatigue.³³ Insufficient dialysis doses may favour anorexia, nausea, hyperparathyroidism and the manifestation of skin symptoms such as pruritus.¹⁴ Furthermore, a higher report of these symptoms may also be related to complications in dialysis treatment. Episodes of high blood pressure, muscle cramps, nausea, vomiting, headaches, chest pain and risk of vascular access infection are common during haemodialysis. Suffering from these types of complications may also have contributed to the higher report of somatic symptoms in chronic kidney disease patients.

The differences in symptoms were less pronounced in Musculoskeletal and Neurosensory categories. We must note that Musculoskeletal symptoms were those most commonly reported by the sample of kidney patients. However, they were also the symptoms most reported by control participants, and as a result, the differences between groups were not the most striking. The higher frequency of Musculoskeletal symptoms in kidney patients in comparison with other types of symptoms is in line with the existing literature, which indicates that Musculoskeletal complaints are among the most common kidney disease complaints.^{34,35} The high prevalence of these symptoms may be explained by calcium metabolic disorders suffered by kidney patients, associated with diseases such as renal osteodystrophy.

Our second objective was to identify the psychosocial variables that may have been significant predictors of the

Table 4. Results of the multiple regression analysis for somatic symptom prediction.

Dependent variable	Predictive variable	β	r^2	t	p
Immunological	Anxiety	0.434	0.174	3.200	0.003
Cardiovascular	Anxiety	0.493	0.189	3.670	0.001
Respiratory	Anxiety	0.520	0.253	4.033	0.000
Gastrointestinal	Anxiety	0.332	0.051	2.285	0.027
Neurosensory	Anxiety	0.445	0.153	3.243	0.002
Musculoskeletal	Anxiety	0.657	0.414	5.759	0.000
Total symptoms	Anxiety	0.539	0.249	4.174	0.000

β : regression line slope value, r^2 : model's predictive capacity index, t: Student's t-test statistic for independent samples, p: probability.

level of somatic symptoms. Previous studies have shown that age and time on dialysis may affect symptoms that appear in patients,³⁶ and as such, we carried out a statistical control on its effect. Nevertheless, in our study age and time on dialysis did not predict the report of somatic symptoms, perhaps because of the limitation imposed by our age criteria (less than or equal to 60 years of age). The results clearly show that anxiety is the main predictor of most somatic symptom categories evaluated and is positively associated with them and explains the 24.9% variance in the total symptoms reported. When we differentiate the different symptom categories from higher to lower explanatory power, anxiety explains 41.4% of variance in Musculoskeletal symptoms, 25.3% in Respiratory symptoms, 18.9% in Cardiovascular symptoms, 17.4% in Immunological symptoms, 15.3% in Neurosensory symptoms and 5.1% in Gastrointestinal symptoms. As such, anxiety very significantly increases most symptoms evaluated, only excluding those related to Skin-Allergy. These results are consistent with previous studies that have shown that anxiety may favour some complications in kidney disease patients, such as high blood pressure.

The association between anxiety and a higher presence of symptoms may be explained by the mechanisms mentioned in the introduction (anxiety is one of the essential components of negative affectivity).⁴ Firstly, the physiological correlates (for example, sympathetic hyperactivity, related to Respiratory and Cardiovascular symptoms), somatic correlates (muscle tension, related to Musculoskeletal symptoms) and neuroendocrine correlates (higher secretion of catecholamines and cortisol, related to Immunological symptoms) of anxiety may directly increase the presence of symptoms. Secondly, it is well-known that anxious subjects experience painful stimulation more intensely,^{37,38} with anxiety decreasing the pain threshold.³⁹ In this sense, it is well-known that there is a vicious circle, through which pain increases the degree of anxiety and the latter in turn increases the perception of pain.⁴⁰ This line of evidence is not limited to pain; several studies have

demonstrated that anxiety may increase the perception of symptoms² through greater interoceptive attention focus, the amplification of these perceptions and their interpretation in more negative terms (attention and interpretative bias). The abovementioned mechanisms are not mutually exclusive, but may be complementary and act simultaneously. As such, dialysis patients with higher levels of anxiety or in general, with greater negative affectivity are those who display a higher limitation in their health-related functional capacity.⁷ In light of our results and taking into account the particular clinical traits of kidney patients, we should contemplate the possibility that anxiety may partly explain the physical complaints for which no clear aetiology has been found in kidney patients.

The exploratory bivariate analysis shows that depression is positively associated with Musculoskeletal, Respiratory, Cardiovascular, Neurosensory and Immunological symptoms and with the total somatic symptoms. The literature widely recognises the association between depression and immunological and cardiovascular system disorders.^{1,15} In dialysis patients in particular, significant associations have been found between depression, immunological parameters and mortality.²¹ Infectious processes, in association with immune dysfunction, are highly relevant and are the main cause of morbidity and the second cause of mortality in dialysis patients.²¹ These results highlight the importance of emotional disorders (anxiety and/or depression) to the understanding and management of symptoms of kidney patients.¹² The patient's Degree of Worry is associated with an increase in Musculoskeletal and Gastrointestinal symptoms and the total symptoms reported. When the Degree of Worry is high, the patient doubts their capacity to face situations related to illness, family, working activity, etc. In these circumstances, the patient tends to focus on their personal flaws, obstacles that they will face and potential negative results, instead of concentrating on the potential means at their disposal that they can use to successfully resolve their problems. As such, if the patient perceives and worries about not being capable of facing

different life situations, this may favour an increase in some of the symptoms reported. By contrast, the Degree of Self-efficacy (the belief that one is capable of successfully facing and having control over life situations) is negatively associated with Respiratory symptoms. When the patient has high self-efficacy, they are sure of their ability to deal with difficult tasks. This view may result in personal achievements, reduce stress and decrease the vulnerability of the latter to negative emotional states.²² This reduction in negative affectivity may explain the decrease in Respiratory symptoms reported. These results support the previous evidence obtained in studies on kidney patients that have shown that perceived self-efficacy is related to a decrease in physical and psychological symptoms.⁹

The correlation analysis demonstrates that social support is associated with a decrease in Respiratory and Musculoskeletal symptoms. Several studies show that social support is negatively associated with morbidity and mortality in various illnesses, positively affecting the functioning of various physiological systems,⁴¹ lessening the effects of stress and reducing negative emotional states.⁶ In kidney patients, we found that social support improves survival and reduces the perception of symptoms.^{10,28,42} Coping strategies Fighting Spirit, through which the patient accepts the diagnosis and tries to adopt actions with the aim of exerting some control over their illness, have been associated with a decrease in Immunological, Respiratory and Musculoskeletal symptoms and the total symptoms reported. By contrast, Fatalism coping strategies (the patient accepts the diagnosis with resignation) and Helplessness-Despair (the patient adopts a pessimistic attitude and abandons any attempt to do anything to improve) have been associated with an increase in Musculoskeletal and Neurosensory symptoms. Coping strategies are usually classified as active or passive. The first refer to cognitive or behavioural efforts to improve the stressful event and the second refer to not dealing with the problem or the tension generated and being more focussed on the emotional response to the problem. The evidence available clearly shows that active strategies are related positively with health indicators, while passive strategies are usually associated with deterioration in the individual's health and state of mind.^{5,43} In this respect, Fighting Spirit is a clear active coping strategy, while Fatalism and Helplessness-Despair are passive strategies.

The regression analysis results clearly suggest that most of the effects of the foregoing variables (depression, worry, self-efficacy, social support and coping strategies) are mediated by the variance that they share with Anxiety. On statistically controlling this shared variable in the first regression models, the predictive capacity of the remaining variables was lost, with only Anxiety remaining as the sole independent predictor. The main limitation of our study is based on the procedure employed to measure somatic symptoms, which consisted of a self-reporting scale. The

scores in these instruments may be affected by a negative affectivity or neuroticism component that may inflate the associations between informed symptoms and measures related to negative affectivity.² As such, it would be recommended to replicate the results obtained with other more direct health indicators, such as reports or medical exams. However, the scale used to measure symptoms is highly valid and correlates with external health condition measurements,²⁷ and this type of scale has been converted into an indispensable tool for health research. Numerous studies have demonstrated the predictive use and validity of these instruments, which are significantly associated with the direct assessment by doctors, reports and medical records, frequency of medical visits and the prediction of future morbidity and mortality.⁴⁴ The scale of symptoms used does not assess sexual problems (for example, loss of libido, impotence, etc.), which are highly prevalent in CKD patients. Given the emotional repercussions of these symptoms, particularly in younger samples, we recommend that there is a need to assess this type of symptom in future studies.

Pain is one of the most serious and common symptoms in patients on regular dialysis.^{35,45} The assessment instrument employed does not have a specific scale for pain, but rather pain symptoms are reported withing each corresponding category. Given the importance pain symptoms in dialysis patients, it would be recommended to measure this type of symptom independently. Another limitation of our study involves the age inclusion criteria established (equal to or less than 60 years of age) given that the dialysis population is generally older. As such, our sample is relatively young for a population on chronic haemodialysis, showing a higher percentage of glomerulonephritis and a lower percentage of vascular-diabetes-unknown origin as causes of kidney disease. The objective of these criteria was to ensure maximum comprehension of the psychological tests and as such, achieve a greater validity in our results. The impact of age on somatic symptoms has been documented,¹³ and as such, our results may not be directly extrapolated to older age samples. From the point of view of treatment, psychosocial intervention in middle-aged dialysis patients has a higher likelihood of being effective and affecting the future impact of symptoms than intervention in older patients.

To conclude, the results of the study suggest that psychological-emotional variables may explain some of the symptoms that have no clear aetiology in kidney patients. They also show that it would be recommended to take psychosocial variables into account when designing intervention programmes to improve symptoms in these patients. Firstly, given that anxiety appeared as the main predictor in most symptom categories, our results show the need for kidney patients to be assessed and treated in their emotional state. Cukor et al.⁴⁶ argued the importance of implementing strategies to improve the diagnosis of anxiety

disorders, since this would lead to an improved quality of life and more effective medical interventions. In this regard, there are currently various interventions that have been shown to effectively reduce different components (physiological, cognitive and behavioural) of anxiety. Interventions must also be focussed on encouraging active coping strategies in the patient, such as Fighting Spirit, and reducing passive coping strategies, such as Fatalism and Helplessness-Despair. Our results also suggest the use of encouraging patient confidence in carrying out tasks related to their illness and thus increasing their coping or self-efficacy capacity. Given the positive effects of social support, these intervention programmes may be implemented as a group treatment or treatment that involves family members.^{46,47} Given the importance of Anxiety in the reporting of somatic symptoms and that the situation faced by kidney patients on dialysis makes them very vulnerable to anxiety disorders, it would be desirable to provide to these patients a preventive approach, in order to avoid the potential appearance of anxiety symptoms. This could also help to prevent the future appearance of various somatic symptoms.^{48,49}

Conflicts of interest

The authors declare that they have no conflicts of interest related to the contents of this article.

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