

Effect of depression on health-related quality of life of renal patients according to the modality of renal replacement therapy

Isabel Vázquez¹, Sonia Pérttega-Díaz^{2,3}, Lorena García-Becerra¹

¹ *Departamento de Psicología Clínica y Psicobiología, Facultad de Psicología, Universidade de Santiago de Compostela, Campus Vida, Calle Xosé María Suárez Núñez, s/n, 15782 Santiago de Compostela, Spain*

² *Division Rheumatology and Health Research Group, Department of Health Sciences, Faculty of Nursing and Podiatry, Universidade da Coruña, Esteiro, 15403 Ferrol, Spain*

³ *Division Nursing and Health Care Research Group, Instituto de Investigación Biomédica de A Coruña (INIBIC), Xubias de Arriba 84, 15006 A Coruña, Spain*

Correspondence: Isabel Vázquez (mariaisabel.vazquez@usc.es)

End-stage renal disease and its treatment with renal replacement therapy (RRT) have a negative impact on patients' quality of life. Among the different RRT options, kidney transplantation is the modality that offers better health-related quality of life (HRQOL) compared to hemodialysis or peritoneal dialysis [1]. In addition to the type of RRT received, depression has been identified as an important predictor of poor HRQOL in both dialysis patients [2] and kidney transplant recipients [3]. However, to the best of our knowledge, previous studies have not compared the impact of depression on HRQOL across the different RRT modalities.

The aim of this study was to determine the influence of depression on the differences in HRQOL between patients on hemodialysis, peritoneal dialysis and renal transplantation.

A total of 229 renal patients over the age of 18 (48.9% on in-center hemodialysis, 19.2% on peritoneal dialysis and 31.9% kidney transplantation recipients) were included in this study. The nephrologist responsible for the patient's care collected information on body mass index, number of previous failed kidney transplants, hematocrit concentration and comorbidity as measured by the Charlson Comorbidity Index. A psychologist collected sociodemographic data (sex, age, educational level, socioeconomic level and marital status) in an interview, and physical activity level using the Brief Physical Activity Assessment Tool (BPAAT).

To assess HRQOL, patients completed the Short-Form 36 Health Survey (SF-36). It consists of 36 items divided into eight dimensions: Physical Functioning, Physical Role, Bodily Pain, General Health, Energy/Fatigue, Social Functioning, Emotional Role, and Mental Health. The eight dimensions can be grouped into two components: the Physical Component Summary and the Mental Component Summary. To quantify the impact of the different RRT modalities on HRQOL, the SF-36 scores were standardized according to the reference values for the Spanish general population for each decade of age and sex [4,5]. Standardized values were expressed as standard deviations from the mean score of the Spanish general population of the same age and sex (which would receive a score of 0).

Depressive symptoms were assessed using the Beck Depression Inventory-II (BDI-II). A BDI-II cut-off ≥ 16 was used to define the presence of depressive symptoms in both dialysis and transplant patients.

There were statistically significant differences between patients in different modalities of RRT regarding age, hematocrit concentration, comorbidity, marital status and physical activity level ($p < 0.05$). Patients on hemodialysis had a higher percentage of depressive symptoms (27.7%) than peritoneal (15.9%) and transplant (17.4%) patients,

although the differences between groups were not statistically significant (Supplementary Table 1).

General linear models were fitted with the standardized scores in each dimension and the two component summaries of the SF-36 as dependent variables. In all the analyses, the RRT modality and depression (analyzed categorically as no depression $\text{BDI-II} < 16$ or depression $\text{BDI-II} \geq 16$) were entered as independent variables, as were the sociodemographic and clinical variables that differed significantly among the three RRT modalities or were associated with each of the dimensions and summaries of the SF-36 in the bivariate analysis at a significance level of $p < 0.10$.

In the multivariable models, after adjustment for sociodemographic and clinical data, dialysis treatment (hemodialysis or peritoneal dialysis) was associated with worse HRQOL compared with kidney transplantation for General Health ($p < 0.01$) and Social Functioning ($p < 0.05$). Hemodialysis treatment was also associated with worse HRQOL in Energy/Fatigue ($p = 0.046$) and Emotional Role ($p = 0.004$), whereas peritoneal dialysis was associated with worse HRQOL in Physical Functioning ($p = 0.007$), Physical Role ($p = 0.026$) and Physical Component Summary ($p = 0.016$). Depression was associated with poorer HRQOL in all dimensions and summary components of the SF-36 ($p < 0.001$). There were significant interactions between RRT modality and depression in the following SF-36 dimensions: Physical Functioning, General Health, Energy/Fatigue, Social Functioning, Emotional Role, Mental Health, and Mental Component Summary ($p < 0.05$). In all cases the effect of depression on HRQOL was greater in renal transplant patients than in dialysis patients (Supplementary Table 2). Transplant patients without depressive symptoms had higher HRQOL scores than dialysis patients, and displayed similar scores to the general population. In contrast, transplant patients with depression had HRQOL scores lower than those of dialysis

patients without depressive symptoms and similar to (or in some dimensions lower than) those of dialysis patients with depressive symptoms (Fig. 1).

This study extends previous research examining the impact of depression on the HRQOL. Our results are in line with previous studies showing that depressive symptoms are important predictors of HRQOL in renal patients in all RRT modalities, but they also reveal that the effect of depressive symptoms on HRQOL is greater in kidney transplant recipients than in dialysis patients. This differential impact of depression on HRQOL according to RRT modality modulates the differences in HRQOL between kidney transplant recipients and patients on hemodialysis or peritoneal dialysis, and even nullifies the benefits of kidney transplantation compared to dialysis.

This study has some limitations. The relatively small sample, especially of peritoneal dialysis patients, may limit the power to estimate the differential impact of depression on patients' HRQOL in the different RRT modalities. In addition, although the most common forms of RRT were considered simultaneously (in-center hemodialysis, peritoneal dialysis and kidney transplantation), other forms of RRT, such as home hemodialysis, were not included. Finally, this study only reports on patients' HRQOL at a specific time point, without taking into account the changes in HRQOL perception over time, particularly at times of transition between treatments.

In conclusion, it is necessary to take the presence of depression into account when assessing the impact of different RRTs on HRQOL, and to identify and treat symptoms of depression in order to improve the HRQOL in dialysis patients and kidney graft recipients, allowing the latter group to enjoy all the benefits of transplantation compared with other modalities of RRT.

Data availability

The datasets collected and analyzed during the current study are available from the corresponding author on reasonable request.

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Contributions

IV contributed to the study conception and design. Material preparation and data collection was performed by LGB. IV and SPD performed data analysis and interpretation. The first draft of the manuscript was written by IV and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Conflict of interest

The authors declare that they have no competing interests.

Ethical approval

This study was performed in line with the principles of the Declaration of Helsinki. The study was approved by the Galician Ethical Research Committee with the code 2016/235.

Consent to participate

Informed consent was obtained from all individual participants included in the study.

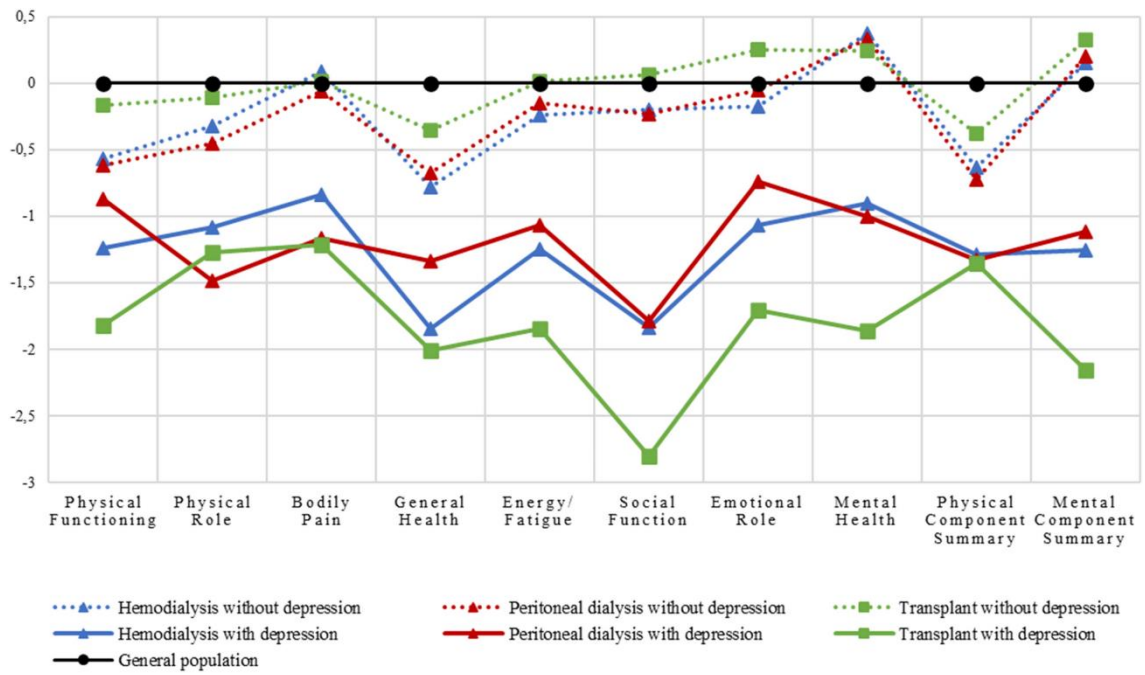


Fig 1. Standardized scores of the SF-36 dimensions and components in hemodialysis, peritoneal dialysis and transplant patients with and without depressive symptoms