

Quality of life and therapeutic adherence analysis in patients after kidney transplantation at Virgen del Rocío University Hospital: a descriptive study

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ABSTRACT

Introduction: Kidney transplantation is the treatment of choice for end-stage renal failure due to its association with patient survival and health-related quality of life. However, lifelong immunosuppressive therapy is necessary to achieve graft survival. This study evaluated health-related quality of life and adherence to immunosuppressive therapy.

Material and Method: A descriptive cross-sectional study was conducted at Virgen del Rocío University Hospital using the ESRD-SCL quality of life questionnaire and the SMAQ adherence questionnaire in patients who had undergone transplantation for over three months.

Results: Forty-two patients participated, with a mean age of 51.19 ± 13.89 years. Item-level results showed a good quality of life. Significant differences were found in the cognitive capacity dimension when comparing quality of life according to transplant duration and the physical capacity dimension among women. A description of adherence to immunosuppressive medication was provided regarding therapeutic adherence.

Conclusions: The results indicated a poorer quality of life in patients with more than 60 months post-transplantation. Adherence should be considered a multifactorial issue in future research, and new measurement methods should be explored.

Keywords: quality of life; treatment compliance and adherence; kidney transplantation.

RESUMEN

Análisis de la calidad de vida y adherencia terapéutica en pacientes tras trasplante renal en el Hospital Universitario Virgen del Rocío: un estudio descriptivo

Introducción: El trasplante de riñón supone la opción de elección como tratamiento en la insuficiencia renal terminal por su relación con la supervivencia del paciente y la calidad de vida relacionada con la salud, siendo necesario posteriormente un tratamiento inmunosupresor para de esta forma lograr la supervivencia del injerto. En este estudio se han evaluado la calidad de vida relacionada con la salud, así como la adherencia a la terapia inmunosupresora.

Material y Método Estudio descriptivo de corte transversal realizado en el Hospital Universitario Virgen del Rocío, empleando el cuestionario de calidad de vida ESRD-SCL y el cuestionario sobre adherencia SMAQ, a pacientes trasplantados de más de tres meses de evolución.

Resultados: Participaron cuarenta y dos pacientes con una edad media de $51,19 \pm 13,89$ años. Los resultados obtenidos por ítems muestran una buena calidad de vida. Al comparar la calidad de vida según tiempo de trasplante se encuentran diferencias significativas en la dimensión capacidad cognitiva; y por sexos en mujeres en la dimensión capacidad física. En cuanto a la adherencia terapéutica se ha realizado una descripción de la adherencia terapéutica a la medicación inmunosupresora.

Conclusiones: Los resultados obtenidos muestran una peor calidad de vida en aquellos pacientes con más de 60 meses de evolución postrasplante. Respecto a la adherencia se debe tener en cuenta el carácter multifactorial en futuras investigaciones y explorar nuevos métodos de medición.

Palabras claves: calidad de vida; cumplimiento y adherencia al tratamiento; trasplante de riñón.

INTRODUCTION

Renal function disorders may lead to either acute or chronic failure¹. Advanced chronic kidney disease (ACKD) is a long-term, irreversible decline in renal function requiring renal replacement therapy (RRT): kidney transplantation, haemodialysis, or peritoneal dialysis¹⁻². The preferred option is kidney transplantation, given its direct association with patient survival, quality of life, and reduced costs³.

A recent meta-analysis highlights that the global prevalence of chronic kidney disease (CKD) ranges from 4% to 13%, making it more common than diabetes, with a higher prevalence among women⁴.

In Spain, the prevalence of CKD has progressively increased, currently reaching 9.2% according to the latest data⁵.

In many countries, this figure continues to rise due to population ageing and the growing burden of cardiovascular and metabolic diseases⁶.

Annual mortality among patients with ACKD ON RRT remains between 8% and 9%, with mortality rates of 15.9% among patients on dialysis vs 2.6% in kidney transplant recipients⁷.

Kidney transplantation reduces costs by eliminating the need for dialysis, with peritoneal dialysis being the most cost-effective dialysis modality⁸. For this reason, health institutions are keen to increase the proportion of donors⁹, as this would generate considerable savings for the public health system that could be redirected to other clinical activities¹⁰.

Kidney transplantation is considered the treatment of choice for patients with ACKD because it improves quality of life, increases life expectancy¹¹, enhances physical and mental health¹, and reduces long-term costs compared with dialysis³.

Achieving these goals requires global and up-to-date data. However, no European kidney transplant registry exists to enable more precise epidemiological studies¹².

Major challenges in the transplant process include the shortage of donors relative to demand, long-term graft loss, and complications due to infections, cancer, or adverse effects of immunosuppressive treatment¹³.

The earliest kidney transplants were affected by immunological rejection, but the introduction of new immunosuppressive agents—such as ciclosporin in the 1980s, and mycophenolate mofetil and tacrolimus in the 1990s¹—improved 1-year survival rates to >90%. However, 10-year graft function remains limited (50%). A major reason for this lack of long-term improvement is poor adherence to immunosuppressive therapy¹⁴⁻¹⁵, which represents a significant clinical problem¹⁶.

Immunosuppressive therapy is divided into 2 phases: induction therapy and maintenance therapy. The standard maintenance regimen consists of a combination of calcineurin inhibitors (tacrolimus or ciclosporin), mycophenolate mofetil, and tapering doses of prednisone, or proliferation signal inhibitors (sirolimus and everolimus)¹⁷⁻¹⁸.

Despite the advantages of kidney transplantation and the improved quality of life compared with patients on dialysis, transplant recipients face challenges upon discharge¹. Analysing risk factors and causes of non-adherence is essential for developing future interventions directed at patients, healthcare professionals, transplant units, and the healthcare system as a whole¹⁵.

Therefore, the aim of this study was to analyse health-related quality of life (HRQoL) and adherence to immunosuppressive medication in kidney transplant recipients.

Specific endpoints:

- To identify the sociodemographic profile of the study population.
- To describe HRQoL in kidney transplant recipients.
- To analyse the relationship between quality of life, time since transplantation, and sex of the study participants.
- To describe adherence to immunosuppressive medication in kidney transplant recipients.

MATERIAL AND METHOD

Study design, setting, and period

We conducted a descriptive, cross-sectional study in the Kidney Transplant Outpatient Clinic at *Hospital Universitario Virgen del Rocío* (HUVR), Seville from May through September 2022.

Population and sample

The study population included all patients attending the HUVR kidney transplant clinic who met the following criteria:

Inclusion criteria: age >18 years; prior treatment with haemodialysis or peritoneal dialysis; >3 months post-transplant, regardless of the number of previous transplants.

Non-probabilistic, consecutive sampling was conducted.

Variables

Collected variables included age, sex, marital status, educational level, time since transplantation, living arrangements, and self-care autonomy. HRQoL and adherence to pharmacological treatment were also assessed.

Measurement instruments

HRQoL: The “End-Stage Renal Disease Symptom Check-List Transplantation Module” (ESRD-SCL), Spanish validated version¹⁹, was used. Originally developed by Franke, this questionnaire comprises 43 items grouped into six dimensions: limited physical capacity (10 items), limited cognitive capacity (8 items), cardiac and renal dysfunction (7 items), corticosteroid side effects (5 items), gingival and hair overgrowth (5 items), and psychological distress associated with transplantation (8 items). Items are scored on a 5-point Likert scale from 0 (not at all) to 4 (extremely), with higher scores indicating poorer HRQoL.

Adherence to immunosuppressive therapy: The “Simplified Medication Adherence Questionnaire” (SMAQ)²⁰, validated in Spanish for kidney transplant recipients, was used as an indirect method. This brief tool consists of six questions assessing different aspects of adherence: forgetfulness, routine, adverse effects, and omission quantification. Adequate validity and interobserver reproducibility have been demonstrated. A patient is classified as non-adherent if any response indicates non-adherence, or if they report missing >2 doses in the previous week or failing to take medication for >2 full days in the previous 3 months.

Procedure: Data were collected in the HUVR kidney transplant clinic. Participants were informed about the study objectives and provided with the questionnaires and the information/informed consent sheet. Anonymity of the collected information was guaranteed.

Statistical analysis: Data were analysed using IBM SPSS Statistics v27.0. Internal consistency of HRQoL dimensions was assessed with Cronbach’s alpha.

Quantitative variables were expressed as mean ± standard deviation, and qualitative variables as absolute frequencies and percentages.

Inferential analysis used parametric or non-parametric tests depending on variable distribution. Statistical significance was set at $p < 0.05$.

Ethical considerations: This study fully complied with the Declaration of Helsinki (World Medical Association, 2013) and with current ethical and legal frameworks for biomedical research, including Regulation (EU) 2018/1725 of the European Parliament and Council (23 October 2018)¹⁴ and Organic Law 3/2018 (5 December 2018) on the Protection of Personal Data and Digital Rights.

The project was approved by Hospitales Virgen Macarena and Virgen del Rocío Research Ethics Committee. Informed consent was obtained from all study participants.

RESULTS

The final sample comprised 42 participants, with a mean age of 51.19 ± 13.89 years; 25 (59.5%) were men. Sociodemographic data for the sample are presented in **table 1**.

Table 1. Sociodemographic characteristics.

Variable	Category	n	%
Sex	Male	25	59.5
	Female	17	40.5
Marital status	Married/partner	24	57.1
	Divorced	3	7.2
	Single	13	30.9
	Widowed	2	4.8
Educational level	Primary education	16	38.1
	Secondary education	13	31.0
	University education	7	16.7
	No formal education	6	14.3
Self-care	Independent	33	78.6
	Supervision/help	9	21.4
Living arrangements	With family or accompanied	30	71.4
	Alone	11	26.2
	No response	1	2.4

Source: Own elaboration.

HRQoL was evaluated in participants who had been transplanted for at least 3 months. First, the internal consistency of the HRQoL dimensions established by the questionnaire was assessed using Cronbach’s alpha (see **table 2**). Results indicated good internal consistency in all dimensions, except for dimension 4 (Side effects of corticosteroids) and dimension 6 (Psychological distress associated with transplantation).

Table 2. Cronbach’s Alpha Coefficient.

Dimension	Cronbach’s Alpha	No. of items
D1. Limited physical capacity	0.818	10
D2. Limited cognitive capacity	0.668	8
D3. Cardiac and renal dysfunction	0.774	7
D4. Side effects of corticosteroids	0.518	5
D5. Growth of facial hair and gums	0.760	5
D6. Psychological distress associated with transplantation	0.526	8

Source: Own elaboration.

The scores for each item within the HRQoL dimensions are shown in **table 3**. The lowest-rated items (most frequently receiving a score of 4) were items 5, 7, 24, and 25, each with a response frequency of 16.7%, followed by item 4 (Tendency to bruise) with 14.3%. The best-rated item was Excessive hair growth, with 88% of the sample scoring 0.

Adherence was analysed using the criteria of the SMAQ questionnaire. Nine of the 42 participants (21.4%) failed to meet the criteria for adherence. Specifically, 14.28% did not take their medication at the prescribed time, 5% discontinued treatment when feeling unwell, and only 2.4% forgot to take medication once or twice per week. No analysis was performed of the relationship between therapeutic adherence and sociodemographic variables.

Inferential analysis compared HRQoL scores according to the different variables studied.

HRQoL dimensions were analysed according to time since transplantation, dividing participants into those with <60 months versus ≥60 months post-transplant. Results are shown in **table 4**.

When comparing HRQoL dimensions according to time since transplantation (**figure 1**), higher scores were observed in all dimensions among participants with a longer transplant duration, indicating poorer HRQoL. These differences reached statistical significance for Limited cognitive capacity ($p = 0.024$). Differences in Limited physical capacity ($p = 0.146$), Cardiac and renal dysfunction ($p = 0.396$), and Corticosteroid side effects ($p = 0.351$) did not reach statistical significance.

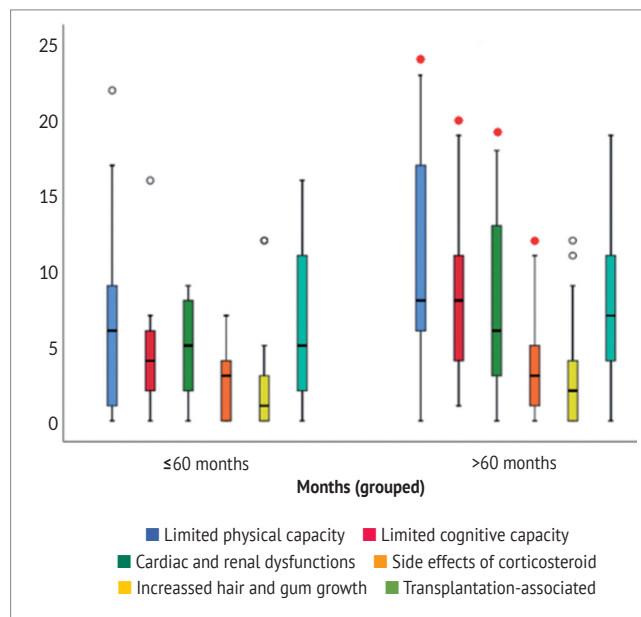


Figure 1. Comparison of HRQoL dimensions according to time since transplantation.

• p value <0.05, Mann-Whitney U hypothesis contrast test.

HRQoL was also analysed by sex (**figure 2**). Statistically significant differences were observed in the Limited physical capacity dimension ($p = 0.024$), with women scoring higher than men. No association was found between HRQoL and age.

DISCUSSION

In general terms, kidney transplantation is presented as a RRT option that allows for good HRQoL. In our study, we observed that, in the specific item referring to general health, 54.8% of participants indicated, “I do not have poor general health”, consistent with data from other studies reporting substantial improvement after transplantation exists to enable more precise epidemiological studies²¹.

Regarding symptoms associated with immunosuppressive medication, other authors have listed several manifestations, with fatigue and joint pain among the most frequent²². Similar results were obtained in the present study, in which the lowest-rated items or those with the highest scores were joint pain, muscle pain, bruising, and fatigue.

Analysis of HRQoL in relation to time since transplantation showed that patients transplanted for >60 months obtained higher scores—although not statistically significant—indicating worse HRQoL vs those transplanted for <60 months. Other studies have reported that overall quality of life scores remain stable up to 2 years post-transplantation exists to enable more precise epidemiological studies¹. Some studies confirm an

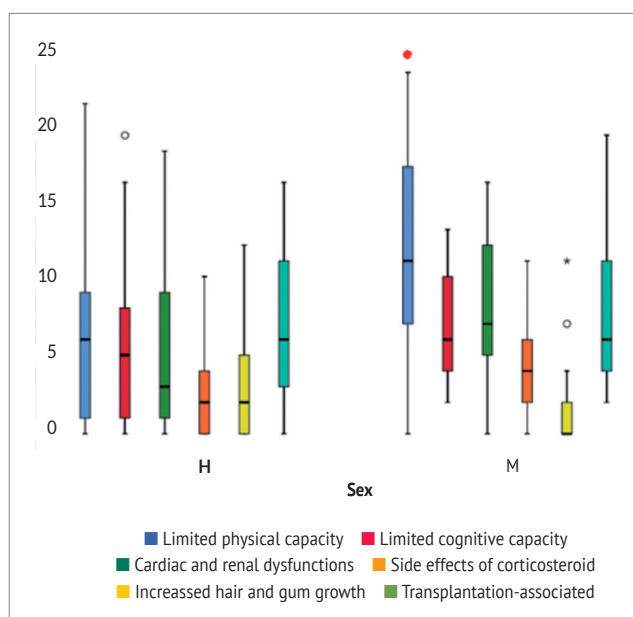


Figure 2. Comparison of HRQoL dimensions according to sex.

• p value <0.05, Mann-Whitney U hypothesis contrast test.

Tabla 3. Descriptive analysis of the questionnaire scores (HRQoL ESRD-SCL).

Item	Punctuation				
	0 (%)	1 (%)	2 (%)	3 (%)	4 (%)
01. Poor general health	54.8	14.3	19.0	11.9	-
02. Limitations of physical capacity	50.0	33.3	9.5	7.1	-
03. Concern about physical appearance	52.4	21.4	11.9	7.1	7.1
04. Limitations of cognitive abilities	69.0	26.2	4.8	-	-
05. Thoughts about transplantation	42.9	21.4	9.5	9.5	16.7
06. Disturbing thoughts about donor of transplant	69.0	16.7	7.1	2.4	4.8
07. Uncertainty about how long the transplant will last	38.1	19.0	14.3	11.9	16.7
08. Nightmares	83.3	7.1	4.8	2.4	2.4
09. Headaches	69.0	9.5	11.9	7.1	2.4
10. Insomnia	40.5	28.6	19.0	9.5	2.4
11. General discomfort	61.9	11.9	19.0	2.4	2.4
12. Difficulty maintaining concentration	64.3	23.8	7.1	4.8	-
13. Nervousness	28.6	21.4	26.2	11.9	11.9
14. Severe dizziness	88.1	9.5	2.4	-	-
15. Anxiety	50.0	21.4	21.4	2.4	4.8
16. Poor memory (recent things)	50.0	31.0	11.9	4.8	2.4
17. Loss of vision	38.1	26.2	16.7	16.7	2.4
18. Hearing loss	61.9	9.5	11.9	16.7	-
19. Tinnitus (ringing in ears)	71.9	16.7	4.8	7.1	-
20. Bad temper	61.9	23.8	4.8	7.1	2.4
21. Palpitations	52.4	23.8	16.7	7.1	-
22. High blood pressure	54.8	19.0	14.3	7.1	4.8
23. Bone pain	42.9	19.0	14.3	4.8	19.0
24. Joint pain	33.3	31.0	11.9	7.1	16.7
25. Muscle pain	40.5	16.7	16.7	9.5	16.7
26. Colds or flu	69.0	23.8	4.8	2.4	-
27. Excessive facial hair growth	78.6	11.9	2.4	4.8	2.4
28. Gum inflammation	59.5	21.4	7.1	7.1	4.8
29. Gum bleeding	64.3	16.7	9.5	4.8	4.8
30. Swollen face	57.1	26.2	11.9	4.8	-
31. Prone to infections	61.9	16.7	9.5	7.1	4.8
32. Swollen feet	71.4	7.1	9.5	7.1	4.8
33. Stomach pain	69.0	16.7	4.8	9.5	-
34. Tingling in legs	57.1	21.4	16.7	2.4	2.4
35. Feeling exhausted	38.1	21.4	16.7	14.3	9.5
36. Gum disorders	66.7	21.4	2.4	4.8	4.8
37. Increased body hair	88.1	4.8	7.1	-	-
38. Swollen face on waking in the morning	69.0	21.4	4.8	2.4	2.4
39. Facial changes	71.4	16.7	9.5	2.4	-
40. Swollen legs	66.7	16.7	2.4	7.1	7.1
41. Prone to bruising	35.7	11.9	4.9	33.3	14.3
42. Intense thirst	50.0	28.6	9.5	7.1	4.8
43. Memory problems	50.0	33.3	9.5	2.4	4.8

Source: Own elaboration.

Table 4. HRQoL dimensions according to time since transplantation (in months).

Dimension	Statistic	< 60 months	> 60 months
Limited physical capacity	Mean	6.82	10.48
	95%CI	3.66–9.98	7.34–13.62
	Median	6.00	8.00
	Standard deviation	6.14	7.60
	Variance	37.779	57.843
Limited cognitive capacity	Mean	4.41	7.61
	95%CI	2.45–6.38	5.66–9.62
	Median	4.00	8.00
	Standard deviation	3.82	4.80
	Variance	14.632	23.073
Cardiac and renal dysfunction	Mean	5.00	7.40
	95%CI	3.33–6.67	4.84–9.94
	Median	5.00	6.00
	Standard deviation	3.24	6.21
	Variance	10.500	38.583
Side effects of corticosteroids	Mean	2.65	3.68
	95%CI	1.43–3.87	2.32–5.04
	Median	3.00	3.00
	Standard deviation	2.37	3.30
	Variance	5.618	10.893
Psychological distress associated with transplantation	Mean	6.35	7.92
	95%CI	3.84–8.86	5.81–10.03
	Median	5.00	7.00
	Standard deviation	4.885	5.123
	Variance	23.868	26.243
Facial hair and gum growth	Mean	2.41	2.92
	95%CI	0.40–4.42	1.43–4.41
	Median	1.00	2.00
	Standard deviation	3.906	3.605
	Variance	15.257	12.993

Source: Own elaboration.

improvement in HRQoL after 3 years exists to enable more precise epidemiological studies²³, although individual variability in long-term outcomes must be considered. Our study assessed quality of life over a longer time frame; therefore, the results are not directly comparable and warrant further investigation in future research.

This study provides cross-sectional data, extending the follow-up period beyond the first 5 years post-transplantation, and reveals a statistically significant decline in cognitive capacity among the transplant population. This finding is consistent with other studies reporting differences of at least 5 points in both physical and mental components exists to enable more precise epidemiological studies²⁴. Careful assessment of psycho-emotional aspects and proactive nursing follow-up are thus required, with care plans tailored to address such alterations.

Sex-based analysis, consistent with other studies, showed that women report worse HRQoL in nearly all dimensions. These results are in line with Costa's study, in which women transplanted for more than 6 months reported poorer HRQoL, linked to emotional factors exists to enable

more precise epidemiological studies²⁵. This suggests that, in women—where coping may rely more heavily on emotional processes—the emotional assessment mentioned earlier has particular relevance.

With respect to therapeutic adherence, a descriptive analysis found that 14.28% of patients did not take their medication at the prescribed time, and nearly 5% discontinued medication when feeling unwell or forgot to take it. This contrasts with other studies reporting that 89.2% of transplant recipients met at least 1 criterion for non-adherence exists to enable more precise epidemiological studies²⁶.

In this regard, a direct relationship has been described between subtherapeutic blood levels of immunosuppressants and acute post-transplant rejection exists to enable more precise epidemiological studies²⁷. However, it should be noted that plasma drug levels may vary individually due to differences in absorption, distribution, or elimination; therefore, subtherapeutic or suprathreshold levels of a given drug cannot be reliably attributed to poor adherence exists to enable more precise epidemiological studies²⁸. Clinical experience has identified non-adherent behaviours that were not reflected in plasma levels, underscoring the need for new monitoring methods. Electronic monitoring of adherence is highly useful, although its routine implementation in clinical practice is limited by the requirement for additional electronic devices exists to enable more precise epidemiological studies²⁹.

Reminder systems rely on electronic devices, including text messages, mobile applications, or the use of electronic medication packaging (EMP) devices within medication containers exists to enable more precise epidemiological studies³⁰. The use of EMP devices and interventions may therefore facilitate adherence monitoring in future research.

This study has limitations, particularly regarding the generalisability of results, as the sample was small due to time constraints, post-COVID-19 attendance issues, and recruitment from a single hospital centre. Nevertheless, the reliability and specificity of the 2 instruments used—both validated for the study population—should be noted.

Given the cross-sectional design, the study will be useful for guiding future health interventions, helping to identify care needs.

In conclusion, based on the results of this study, HRQoL in renal transplant patients is generally perceived as good.

However, participants reported symptoms associated with distressing thoughts about the transplant, uncertainty about graft function, and physical symptoms. A decline in HRQoL was also observed as time since transplantation increased, with a statistically significant deterioration in the domain of “cognitive capacity limitation” at 5 years post-transplantation. Furthermore, women exhibited poorer overall HRQoL, with a statistically significant difference in the domain of “physical capacity limitation.” While further research with larger samples is required, female sex appears to be associated with poorer HRQoL.

As for adherence, the data obtained in this study are not comparable with those reported in the scientific literature. It is therefore likely that future studies with larger samples, complemented by qualitative research, will be required to account for the multifactorial nature of adherence measurement.

Conflicts of interest

None declared.

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None declared.

REFERENCES

- Mansouri P, Sayari R, Dehghani Z, Hosseini FN. Comparison of the effect of multimedia and booklet methods on quality of life of kidney transplant patients: A randomized clinical trial study. *Int J Community Based Nurs Midwifery*. 2020;8(1):12-22.
- Jones-Hughes T, Snowsill T, Haasova M, Coelho H, Crathorne L, Cooper C, et al. Immunosuppressive therapy for kidney transplantation in adults: a systematic review and economic model. *Health Technol Assess (Rockv)*. 2016;20(62):1-594.
- Heemann U, Oberbauer R, Sprangers B, Gökalp C, Bemelman F. Deceased donor kidney allocation schemes and international exchange. *Curr Opin Organ Transplant*. 2020;25(1):66-73.
- Hill NR, Fatoba ST, Oke JL, Hirst JA, O'Callaghan CA, Lasserson DS, et al. Global prevalence of chronic kidney disease - A systematic review and meta-analysis. *PLoS ONE*. 2016 Jul 6;11(7):e0158765. Available from: <https://www.phc.ox.ac.uk/publications/629300>
- Gorostidi M, Sánchez-Martínez M, Ruilope LM, Graciani A, de la Cruz JJ, Santamaría R, et al. Prevalencia de enfermedad renal crónica en España: impacto de la acumulación de factores de riesgo cardiovascular. *Nefrología*. 2018;38(6):606-15.
- Wetmore JB, Collins AJ. Global challenges posed by the growth of end-stage renal disease. *Ren Replace Ther*. 2016;2(1):15.
- Durán BM. Informe de Diálisis y Trasplante 2014. XLIX Congreso Nacional de la Sociedad Española de Nefrología. A Coruña. 2019;73.
- Conde Olasagasti JL, Garcia Diaz JE, Carrasco Benitez P, Mareque Ruiz MÁ, Parras Partido MP, Moreno Alia I, et al. Análisis de costes del programa integrado de tratamiento renal sustitutivo en la provincia de Toledo (2012-2013). *Nefrología*. 2017;37(3):285-92.
- Haller M, Gutjahr G, Kramar R, Harnoncourt F, Oberbauer R. Cost-effectiveness analysis of renal replacement therapy in Austria. *Nephrol Dial Transpl*. 2011;26:2988-95.
- Ministerio de Sanidad SSEL. Ministerio de sanidad, servicios sociales e igualdad gabinete de prensa. Nota de prensa. 2018;1-4.
- Muñoz YD, Valle RC, Manrique MLC. Factors associated with resilience and therapeutic adherence in patients with functioning renal graft. *Enferm Nefrol*. 2018;21(2):123-9.
- Coemans M, Süsal C, Döhler B, Anglicheau D, Giral M, Bestard O, et al. Analyses of the short- and long-term graft survival after kidney transplantation in Europe between 1986 and 2015. *Kidney Int*. 2018;94(5):964-73.
- Anglicheau D, Tinel C, Canaud G, Loupy A, Zuber J, Delville M, et al. Transplantation rénale: réalisation et suivi précoce. *Néphrologie & Thérapeutique*. 2019;15(6):469-84.
- Zhu Y, Zhou Y, Zhang L, Zhang J, Lin J. Efficacy of interventions for adherence to the immunosuppressive therapy in kidney transplant recipients: a meta-analysis and systematic review. *J Investig Med*. 2017;65(7):1049-56.
- Sanders-Pinheiro H, Colugnati FAB, Marsicano EO, De Geest S, Medina JOP. Prevalence and correlates of non-adherence to immunosuppressants and to health behaviours in patients after kidney transplantation in Brazil - the adhere Brazil multicentre study: a cross-sectional study protocol. *BMC Nephrol*. 2018;19(1):41.
- Low JK, Crawford K, Manias E, Williams A. A compilation of consumers' stories: the development of a video to enhance medication adherence in newly transplanted kidney recipients. *J Adv Nurs*. 2016;72(4):813-24.
- Jansz TT, Bonenkamp AA, Boereboom FTJ, van Reekum FE, Verhaar MC, van Jaarsveld BC. Health-related quality of life compared between kidney transplantation and nocturnal hemodialysis. *PLoS One*. 2018;13(9):e0204405.

18. Ilori TO, Adedinsewo DA, Odewole O, Enofe N, Ojo AO, McClellan W, et al. Racial and Ethnic Disparities in Graft and Recipient Survival in Elderly Kidney Transplant Recipients. *J Am Geriatr Soc*. 2015;63(12):2485–93.
19. Ortega T, Valdés C, Rebollo P, Ortega F. Evaluation of Reliability and Validity of Spanish Version of the End-Stage Renal Disease Symptom Checklist–Transplantation Module. *Transplantation*. 2007;84(11):1428–35.
20. Ortega Suárez F, Sánchez Plumed J, Pérez Valentín M, Pereira Palomo P, Muñoz Cepeda M, Lorenzo Aguiar D, et al. Validación del cuestionario simplificado de adherencia a la medicación (SMAQ) en pacientes con trasplante renal en terapia con tacrolimus. 2011;31(6):690–6.
21. Costa-Requena G, Cantarell MC, Moreso F, Parramon G, Seron D. Calidad de vida relacionada con la salud en el trasplante renal: seguimiento longitudinal a 2 años. *Med Clin (Barc)*. 2017;149(3):114–8.
22. Koller A, Denhaerynck K, Moons P, Steiger J, Bock A, De Geest S. Distress associated with adverse effects of immunosuppressive medication in kidney transplant recipients. *Prog Transplant*. 2010;20(1):40–6.
23. Von Der Lippe N, Waldum B, Brekke FB, Amro AAG, Reisæter AV, Os I. From dialysis to transplantation: A 5-year longitudinal study on self-reported quality of life. *BMC Nephrol*. 2014;15(1):191.
24. Griva K, Stygall J, Ng JH, Davenport A, Harrison MJ, Newman S. Prospective Changes in Health-Related Quality of Life and Emotional Outcomes in Kidney Transplantation over 6 Years. *J Transplant*. 2011;2011:1–12.
25. Costa-Requena G, Cantarell Aixendri MC, Rodriguez Urrutia A, Seron Micas D. Calidad de vida relacionada con la salud y trasplante renal: comparación con los valores poblacionales a los 6 meses postrasplante. *Med Clin (Barc)*. 2014;142(9):393–6.
26. Teng S, Zhang S, Zhang W, Lin X, Shang Y, Peng X, et al. Symptom Experience Associated With Immunosuppressive Medications in Chinese Kidney Transplant Recipients. *J Nurs Scholarsh*. 2015;47(5):425–34. <https://doi.org/10.1111/jnu.12157>. Epub 2015 Jul 28. PMID: 26219726.
27. Scheel J, Reber S, Stoessel L, Waldmann E, Jank S, Eckardt K-U, et al. Patient-reported non-adherence and immunosuppressant trough levels are associated with rejection after renal transplantation. *BMC Nephrol*. 2017;18(1):107.
28. Pagès-Puigdemont N, Valverde-Merino MI. Métodos para medir la adherencia terapéutica. *Ars Pharm*. 2018;59(3):163–72.
29. Jung H-Y, Seong SJ, Choi J-Y, Cho J-H, Park S-H, Kim C-D, et al. The efficacy and stability of an information and communication technology-based centralized monitoring system of adherence to immunosuppressive medication in kidney transplant recipients: study protocol for a randomized controlled trial. *Trials*. 2017;18(1):480.
30. Pagès-Puigdemont N, Valverde-Merino MI. Adherencia terapéutica: factores modificadores y estrategias de mejora. *Ars Pharm*. 2018;59(4):251–8.



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