ABCS HEALTH SCIENCES

ORIGINAL ARTICLE

OPEN ACCESS

Medical and non-medical factors that influence the kidney transplantation technical registry: a cross-sectional study

Juliana Dall'Agnol[1], Eda Schwartz[1,2], Vanclei Zanin[3]

[1]Programa de Pós Graduação em Enfermagem, Universidade Federal de Pelotas (UFPel) - Pelotas (RS), Brazil
[2]Programa de Mestrado Profissional em Saúde da Família, Universidade Federal de Pelotas (UFPel) - Pelotas (RS), Brazil
[3]Instituto de Ciências Econômicas, Administrativas e Contábeis, Universidade Federal do Rio Grande (FURG) - Santo Antonio da Patrulha (RS), Brazil

ABSTRACT

Introduction: Chronic kidney disease is a worldwide public health problem, because of its association with an elevated risk of mortality, low quality of life, and prohibitive cost to the health system. **Objective:** To identify the factors that might influence the kidney transplantation technical registry. **Methods:** Cross-sectional study of descriptive analysis conducted in six dialysis health care centers in the south of Rio Grande do Sul, Brazil. Patients over 18 years of age were included in this study in 2016 and 2017. The demographic and clinical variables were subjected to Pearson's chi-square test using Stata Software for statistical analysis. Research approved by the Ethics Committee 1386385. **Results:** Of 314 participants, 228 (72.6%) were not on the kidney transplantation technical registry. The medical and non-medical factors with statistical significance were age ($p<0.01$), income ($p<0.01$), having children ($p=0.01$), time since diagnosis ($p=0.01$), and time on hemodialysis ($p=0.01$). **Conclusion:** There is a substantial proportion of 72.6% of hemodialysis patients not registered on the kidney transplantation technical registry. The identification of factors that influence the kidney transplantation technical registry contributes both theoretically and to healthcare management, by the health team and government who can direct strategies towards the most appropriate health care. Health professionals should be aware of the impact of these factors and how the factors might pose a risk of complications that make it impossible to register on the kidney transplantation waiting list.

Keywords: kidney transplantation; dialysis; renal insufficiency, chronic; waiting lists.

How to cite this article: Dall'Agnol et al. Medical and non-medical factors that influence the kidney transplantation technical registry: a cross-sectional study. ABCS Health Sci. 2023;48:e023217 https://doi.org/10.7322/abcshs.2021115.1843

Received: May 17, 2021
Revised: Aug 01, 2021
Approved: Oct 14, 2021

Corresponding author: Juliana Dall'Agnol - Universidade Federal de Pelotas – Rua Gomes Carneiro, 01 – Centro - CEP: 96075-630 - Pelotas (RS), Brazil - E-mail: dalljuliana@gmail.com

Declaration of interests: nothing to declare.
Funding: CAPES (Finance Code 001), CNPq (442502/2014-1)

INTRODUCTION

Chronic kidney disease (CKD) is associated with an elevated risk of mortality, inferior quality of life, and prohibitive cost to the health system, and is considered a global public health problem[1-3]. Worldwide, an estimated 850 million people have kidney disease, and these may require renal replacement therapy such as dialysis or kidney transplantation for their survival[4,5]. More than 5 million people die each year

worldwide because of a lack of access to kidney care. It is estimated that by 2040 chronic kidney disease will be among the top 5 leading causes of death[3,6].

The prohibitive cost of CKD treatment is one of the main factors contributing to high morbidity and mortality rates, although this effect is often masked by its associated comorbidities[4]. The economy of resources to the health system combined with better survival and quality of life characterizes kidney transplantation as the best alternative for people with end-stage CKD[1,2,7-11].

Access to the kidney transplant technical registry consists of a few steps. The Brazilian legislation informs that all dialysis patients should have equal access to the technical registry for kidney transplantation. However, the literature[12-19] points out that there are clinical and non-clinical factors that can influence and even condition the kidney transplant technical registry, such as gender, age, years of study, ethnicity, income, place of residence, presence of comorbidities, time of dialysis, and recurrent hospitalization.

In Brazil, in July 2019 there were an estimated 139,691 patients on dialysis, with 93.2% on hemodialysis and 6.8% on peritoneal dialysis[20]. Continuous outpatient peritoneal dialysis is offered by 55% of dialysis centers and there are 33,015 patients (23.6%) on a transplant waiting list. The annual mortality rate is 18.2%. It is observed that before the number of patients on dialysis (139,691) there is a low proportion (23.63%) of patients on the waiting list (33,015) for transplantation[20]. Thus, the question arises what are the medical and non-medical factors that may be influencing the technical enrollment for kidney transplantation?

Thus, this study aimed to identify the clinical and non-clinical factors that may influence access to the technical registry for kidney transplantation.

METHODS

Study site

Cross-sectional study with descriptive analysis. Data were collected from six renal replacement therapy services located in five municipalities in the southern Rio Grande do Sul, Brazil. The interviews occurred between the years 2016 and 2017 during hemodialysis sessions. A previously tested structured questionnaire was used.

Study population

The sample for this study included all hemodialysis patients from six renal replacement therapy services. Non-probability sampling. The study population was made up of patients over 18 years of age, with preserved oral and cognitive communication and who agreed to participate in the study and signed the free and informed consent form. Patients who did not have the clinical conditions to answer the questionnaire were excluded.

Data Collection

To determine the variables that would be part of this study, a systematic literature review was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses methodology in PubMed, Web of Science, and Scielo.org databases. The PICO strategy was used, considering, "P" study population in renal replacement treatment, "I" the observational studies design to know which factors interfere with the access to the waiting list for renal transplantation, "C" the context, worldwide, "O" the results obtained regarding the factors hindering the access to the waiting list for renal transplantation. The evidence was grouped, by thematic similarity, in categories called demographic/socioeconomic factors, clinical factors, service characteristics, and reasons referred. As for the design, all were observational studies, 60% were developed in Europe, 30% in the Americas, and 10% in Asia. The clinical and non-clinical factors that presented statistical significance regarding access to the kidney transplant waiting list were gender, age, years of study, ethnicity, income, place of residence, presence of comorbidities, time on dialysis, and hospitalization.

The results of the systematic review served as the basis for the design of the present study. Thus, the variable age was stratified into four age groups (≥18-39, 40-59, 60-79, and≥80 years). The nominal color variable was segmented into white, black, brown, and yellow. The family income variable was divided into three ranges corresponding to the value of the Brazilian minimum wage in 2016 (≤R$880.00; R$880.01-R$2640.00; ≥R$2640.01). The nominal marital status variable was divided into the married or stable union, single, separated/divorced, and widowed. The variable years of education it was stratified by ranges of 0, 1-4, 5-9, 10-12, and≥13 years. Regarding time since diagnosis of chronic kidney disease and time of treatment, initiation was divided into two groups ≤60 months or ≥61 months (corresponds to ≤5 or >5 years). The variables knowing how to read, having multimorbidity, having expenses with chronic kidney disease, having already performed transplantation, hospitalization, being in the technical registry for kidney transplantation, living alone, and having children were categorized as dichotomous. The variables gender (female or male) and area d and residence (rural or urban) were categorized as nominal.

Statistical Analysis

Of the 335 questionnaires answered, 21 had inconsistencies or were incomplete (missing) and, therefore, were excluded from the analysis. The relationship between the independent categorical variables and the dependent one (registration in the renal transplantation technical registry) was analyzed using Pearson's chi-square test (χ^2). The multivariate analysis (probit model) was performed using the same variables (dependent variable and independent variables) as the univariate model.

For the analysis of the distribution of independent variables with the dependent one, a confidence interval of 95% was considered, assuming for statistical significance a value of $p<0.05$. All statistical analyses were performed in *Stata software*, version 13.

Ethical Aspects

The research received approval from the Research Ethics Committee opinion number 1.386385 and certificate CAAE 51678615300005316.

RESULTS

From the total of 335 individuals on hemodialysis, data from 314 individuals on hemodialysis who completely answered the questionnaire were included, of which, 72.6% (228) were not registered in the technical registry for kidney transplantation.

The factors stratified by technical enrollment for kidney transplantation can be seen in Table 1. The non-clinical factors that proved statistically significant in the technical registry for kidney transplantation were age, family income, and having children (Table 1).

Table 1: Non-clinical factors stratified by registration in the technical registry for kidney transplantation in the Southern Rio Grande do Sul, Brazil, 2017 (n=314)

Non-clinical factors	Not in the kidney transplantation technical registry 228 (72.6%)	Listed in the kidney transplantation technical registry 86 (27.4%)	p
Age			**<0.001**
18-39 years old	19 (46.3)	22 (53.6)	
40-59 years old	70 (62.5)	42 (37.5)	
60-79 years old	116 (84.0)	22 (15.9)	
80 years and older	23 (100)	0 (0)	
Sex			0.134
Male	138 (75.8)	44 (24.1)	
Female	90 (68.1)	42 (31.8)	
Color			0.291
White	162 (75.3)	53 (24.6)	
Black	38 (66.6)	19 (33.3)	
Brown	26 (65.0)	14 (35.0)	
Yellow	2 (100)	0 (0)	
Family Income*			**0.006**
≤ R$880.00	39 (84.7)	7 (15.2)	
≥ R$880.01 ≤ R$2640.00	164 (73.5)	59 (26.4)	
≥ R$2640.01	25 (55.5)	20 (44.4)	
Lives Alone			0.1
No	190 (70.9)	78 (29.1)	
Yes	38 (82.6)	8 (17.3)	
Area of residence			0.522
Rural Area	21 (67.7)	10 (32.2)	
Urban Area	207 (73.1)	76 (26.8)	
Has children			**0.012**
No	29 (58.0)	21 (42.0)	
Yes	199 (75.3)	65 (24.6)	
Marital Status			0.208
Married/Stable Union	118 (68.6)	54 (31.4)	
Single	51 (72.8)	19 (27.1)	
Divorced	23(82.1)	5 (17.8)	
Widower	36 (81.8)	8 (18.1)	
Know how to read			0.402
No	29(78.3)	8 (21.6)	
Yes	199(71.8)	78 (27.3)	
Years Studied			0.6
Did not study	20 (80.0)	5 (20.0)	
Up to 4 years	72 (73.4)	26 (26.5)	
Between 5 and 9 years old	85 (72.6)	32 (27.3)	
Between 10 and 12 years old	34 (73.9)	12 (26.0)	
More than 13 years	17 (60.7)	12 (39.2)	
There are expenses with the disease			0.232
No	57 (78.0)	16 (21.9)	
Yes	171 (70.9)	70 (29.0)	

* Minimum wage in 2016: R$880.00.

The non-clinical factor age was statistically significant in Pearson's test, indicating dependence between the variables. Furthermore, it is noted that there is an inverse relationship between age and being on the technical registry, so in the 18-39 age range 19 (46.3%) of the patients are not registered, at the other extreme, all 23 (100%) patients aged 80 years, or more are not registered.

Family income, a non-clinical factor, also proved to be statistically significant. It is observed that 25 (55.5%) of patients with family income ≥R$2640.01 are not on the technical registry for kidney transplantation. At the other extreme, 39 (84.7%) of patients who have a family income of less than one minimum wage (≤R$880.00) are not in the technical registry for kidney transplantation.

Of the patients who have children, 199 (75.3%) are not registered in the technical registry. On the other hand, among the patients who do not have children, 29 (58.0%) are not in the technical registry for kidney transplantation.

The clinical factors that showed statistical significance were the time of diagnosis and time on hemodialysis (Table 2). Regarding the time of diagnosis and time on hemodialysis less than or equal to 5 years 137 (77.8%) and 148 (77.4%) of the patients, respectively, were not in the technical registry for kidney transplantation. Concerning the time of diagnosis greater than five years, 91 (66.0%) were not in the technical registry for renal transplantation, while the patients with time in hemodialysis greater than five years, 80 (65.1%) of the patients were not registered. It is observed, therefore, that the percentages of time of diagnosis and time on hemodialysis are quite similar. Since, the longer the time in diagnosis and in hemodialysis the higher the proportion of being in the technical registry for renal transplantation.

In the multivariate analysis, only the variables family income ($p<0.01$) and age ($p<0.01$) were statistically significant to explain being or not on the technical registry for kidney transplantation. Thus, the higher the family income, the higher the probability of being enrolled, and the higher the age, the lower the possibility of being on the technical registry for kidney transplantation. The other variables, although not statistically significant, showed an expected (positive/negative) relationship regarding being or not on the technical registry for kidney transplantation. Given the result of the multivariate analysis with statistical significance of only two variables, it was decided to maintain the univariate analysis that despite its simplicity achieved the objective proposed in this study.

DISCUSSION

The significant increase in end-stage CKD patients represents a serious public health problem in Brazil as it affects the lives of thousands of Brazilians and burdens the public coffers[20]. Several studies[2-4,12-19] have observed that besides clinical factors, non-clinical factors play a key role regarding access to the technical registry for kidney transplantation. In front of the population in socioeconomic vulnerability[2,4,16-19], corroborating the findings of this study.

It was observed that the age factor influences the technical registration for kidney transplantation because older people are less likely to be registered. This result may be related to the increase of multimorbidities as age advances, which may contribute to clinical conditions that are not suitable for a surgical procedure[1,19,21]. However, it is pointed out that kidney transplantation provides longer survival and better quality of life, even among elderly patients[19,21].

Patients with low family income are in a lower proportion in the technical registry for kidney transplantation (15.2%).

Table 2: Clinical factors stratified by registration in the technical registry for kidney transplantation in Southern Rio Grande do Sul, Brazil, 2017 (n=314)

Clinical Factors	Not in the kidney transplantation technical registry 228 (72.6%)	Listed in the kidney transplantation technical registry 86 (27.4%)	p
Diagnostic Time			**0.019**
≤ 5 years	137 (77.8)	39 (22.1)	
> 5 years	91 (66.0)	47 (34.0)	
Time on hemodialysis			**0.016**
≤ 5 years	148 (77.4)	43 (22.5)	
> 5 years	80 (65.1)	43 (34.9)	
Ever performed transplantation			0.14
No	215 (73.6)	77 (26.3)	
Yes	13(59.0)	9 (40.9)	
Hospital admissions			0.523
No	15 (78.9)	4 (21.0)	
Yes	213 (72.2)	82 (27.8)	
Has multimorbidity			0.3
No	59 (64.1)	33 (35.8)	
Yes	169 (76.1)	53 (23.8)	

Source: survey results.

This point may be even more important in the southern Rio Grande do Sul, a region with a Socioeconomic Development Index below the state average[22,23]. It is notorious that socioeconomic vulnerability impacts how and where individuals live, as well as their food choices, access to education, employment opportunities, access to technology and innovations, and their knowledge and exercise of their rights[24]. This situation may negatively impact the worsening of clinical conditions of the individual with CKD and consequently access to the technical registry for kidney transplantation.

It should be mentioned that individuals with CKD on hemodialysis, even receiving treatment from the Brazilian Unified Health System (SUS), need medicines, special food, additional tests, and frequent travel to health services, which tends to burden more low-income patients. The vulnerability of the chronic renal patient on hemodialysis is multifactorial and multifaceted[25]. Thus, the need for attention at all levels of health care is emphasized, as well as the other sectors need to be articulated together with measures of social protection.

In this context of health care spending, the excessive cost of CKD treatment is one of the main factors contributing to high morbidity and mortality rates, although this effect is often masked by its associated comorbidities[4]. Regarding the economic factor, in Brazil, if the deceased donor kidney transplant is the adopted treatment, the economy for SUS would be R$ 73,791.80 per patient, totaling R$ 11.8 billion in four years. In the case of living donor kidney transplantation, the economy increases to R$ 82,309.04 per patient, and a saving of R$ 13.2 billion[7] to the public coffers. The break-even point of the accumulated costs of hemodialysis is offset by the costs of renal transplantation 32 months after the kidney transplant surgery. This Brazilian study[7] points out that at the end of the four-year follow-up cohort, savings of R$ 37,083.63 per patient are achieved.

An explanation for why patients with children are in a lower proportion in the technical registry (24.6%) is due to the impact of the entire process related to transplantation, which includes additional family expenses and the absence of the family member who needs to travel to the transplant center. The change in the necessary family dynamics caused by the possibility of transplantation includes the loss of work of the members who have an occupational activity and school dropout of children and adolescents[26-28] due to the necessity of permanent and frequent attendance to the transplantation service. It is important to consider that a family member can be a related living donor, but if the family has objections to donating the kidney the process is soon interrupted[29].

In contrast to other studies[12,16-18], the present study did not show statistical significance in terms of education, although patients with a low level of education were less likely to be on the technical registry for kidney transplantation.

The largest proportion of patients (72.6%) was not registered in the technical registry for kidney transplantation, this may be related to the fact that this option is not being presented to the patient at the beginning of hemodialysis treatment. In addition, the healthcare team may not yet have discussed the available treatment options with the patient due to the circumstances of the initiation of dialysis.

Health education regarding the modalities available for initiating treatment and planning for technical enrollment for kidney transplantation can significantly affect patients' experiences and outcomes[21]. Moreover, the lack of protocols that guide the planning with the patient to the possibility of renal transplantation at the beginning of treatment leads the patient to shorter survival and higher morbidity[2,26-28], which compromises the feasibility of access to the technical registry[1]. Due to this, there is a delay in the technical registry for kidney transplantation[2-6,9]. Therefore, research is needed to evaluate the optimal order of exit strategies from hemodialysis to kidney transplantation. To this end, it is imperative to decrease the chances of intercurrences during the time of diagnosis and time of hemodialysis treatment, to keep the patient.

The limitations of this study refer to the fact that it is a cross-sectional study, not possible to control cause and effect. The univariate analysis of the data, although subject to the effect of confounding variables, proved to meet the proposed objective. However, there is room for novel studies to be developed with updated data since these were collected in 2016 and 2017. Moreover, it is important to note that the findings of this study contribute by identifying the clinical and non-clinical factors of patients with CKD on hemodialysis that can influence the technical enrollment for kidney transplantation.

Finally, the theoretical contributions of the results of this study point to the need to identify which clinical and non-clinical factors may influence the technical record for kidney transplantation. That said, it is emphasized the importance of keeping the patient on adequate hemodialysis so that he has the minimum clinical conditions for kidney transplantation. It is emphasized that early diagnosis of patients with multimorbidities such as diabetes and hypertension in primary health care may be an alternative for developing countries[6,12,24]. These findings contribute to both managers and health professionals who are responsible for managing health care, and it is important to pay attention to interventions in primary care to control risk factors and slow the progression of CKD.

Finally, we recommend social actions aimed at health education for patients and their families. And to health services, the performance of complete records in medical records including comorbidities, and the planning of consultations and tests as recommended. These actions can help in the identification of populations at risk and critical points of CKD.

Conclusion

Of the 314 patients on hemodialysis 228 (72.6%) were not on the technical registry for kidney transplantation. The clinical and non-clinical factors that showed statistical significance were age (p<0.01), income (p<0.01) having children (p=0.01), time of diagnosis (p=0.01), and time on hemodialysis (p=0.01). The identification of clinical and non-clinical factors that may influence technical enrollment enables the health team and managers to direct actions/strategies for the most appropriate health care. Healthcare professionals should be aware of the impact that these factors have and that they may offer the risk of complications that make technical enrollment for kidney transplantation unfeasible. This implies also evaluating the relevance that each factor (either clinical or non-clinical) exerts on each patient and his family.

Furthermore, studies in other Brazilian regions that identify clinical and non-clinical factors are suggested. Furthermore, we emphasize the need to develop strategies that can assess patients with the possibility of developing CKD at all levels of care.

REFERENCES

1. Chadban SJ, Ahn C, Axelrod DA, Foster BJ, Kasiske BL, Kher V, et al. KDIGO Clinical Practice Guideline on the Evaluation and Management of Candidates for Kidney Transplantation. Transplantation. 2020;104(4S1 Suppl 1):S11-103. https://doi.org/10.1097/TP.0000000000003136

2. Chan CT, Blankestijn PJ, Dember LM, Gallieni M, Harris DCH, Lok CE et al. Dialysis initiation, modality choice, access, and prescription: conclusions from a Kidney Disease: Improving Global Outcomes (KDIGO) Controversies Conference. Kidney Int. 2019;96(1):37-47. https://doi.org/10.1016/j.kint.2019.01.017

3. Foreman KJ, Marquez N, Dolgert A, Fukutaki K, Fullman N, McGaughey M, et al. Forecasting life expectancy, years of life lost, and all-cause and cause-specific mortality for 250 causes of death: reference and alternative scenarios for 2016-40 for 195 countries and territories. Lancet. 2018;392(10159):2052-90. https://doi.org/10.1016/S0140-6736(18)31694-5

4. Luyckx VA, Tonelli M, Stanifer JW. The global burden of kidney disease and the sustainable development goals. Bull World Health Organ. 2018;96(6):414-22. https://doi.org/10.2471/BLT.17.206441

5. Jager KJ, Kovesdy C, Langham R, Rosenberg M, Jha V, Zoccali C. Single number for advocacy and communication worldwide more than 850 million individuals have kidney diseases. Kidney Int. 2019;96(5):1048-50. https://doi.org/10.1016/j.kint.2019.07.012

6. Luyckx VA, Al-Aly Z, Bello AK, Bello AK, Bellorin-Font E, Carlini RG, et al. Sustainable Development Goals relevant to kidney health: an update on progress. Nat Rev Nephrol. 2021;17(1):15-32. https://doi.org/10.1038/s41581-020-00363-6

7. Silva SB, Caulliraux HM, Araújo CAS, Rocha E. Cost comparison of kidney transplant versus dialysis in Brazil. Cad Saude Publica. 2016;32(6):e00013515. https://doi.org/10.1590/0102-311x00013515

8. Morton RL, Schlackow I, Gray A, Emberson J, Herrington W, Staplin N, et al. Impact of CKD on Household Income. Kidney Int Rep. 2017;3(3):610-18. https://doi.org/10.1016/j.ekir.2017.12.008

9. Vanholder R, Annemans L, Brown E, Gansevoort R, Gout-Zwart JJ, Lameire N, et al. Reducing the costs of chronic kidney disease while delivering quality health care: a call to action. Nat Rev Nephrol. 2017;13(1):393-409. https://doi.org/10.1038/nrneph.2017.63

10. Wolfe RA, Ashby VB, Milford EL, Ojo AO, Ettenger RE, Agodoa LY, et al. Comparison of mortality in all patients on dialysis, patients on dialysis awaiting transplantation, and recipients of a first cadaveric transplant. N Engl J Med. 1999;341(1):1725-30. https://doi.org/10.1056/ NEJM199912023412303

11. Port FK, Wolfie RA, Mauger EA, Berling DP, Jiang KJ. Comparison of survival probabilities for dialysis patients vs cadaveric renal transplant recipients. JAMA. 1993;270(1):1339-43. https://doi.org/10.1001/jama.1993.03510110079036

12. Taylor DM, Bradley JA, Bradley C, Draper H, Dudley C, Fogarty D, et al. Limited health literacy is associated with reduced access to kidney transplantation. Kidney Int. 2019;95(5):1244-52. https://doi.org/10.1016/ j.kint.2018.12.021

13. Bayat S, Frimat L, Thilly N, Loos C, Brianc S, Kessler M. Medical and non-medical determinants of access to renal transplant waiting list in a French community-based network of care. Nephrol Dial Transplant 2006;21(10):2900-7. https://doi.org/10.1093/ndt/gfl329

14. Bayat S, Macher MA, Couchoud C, Bayer F, Lassalle M, Villar E, et al. Individual and regional factors of access to the renal transplant waiting list in France in a cohort of dialyzed patients. Am J Transplant. 2015;15(4):1050-60. https://doi.org/10.1111/ajt.13095

15. Erdem E, Karatas A, Ecder T. Factors affecting registration on kidney transplant waiting list. Turk J Nephrol. 2019;28:280-5. https://doi.org/10.5152/turkjnephrol.2019.3557

16. Zhang Y, Gerdtham UG, Rydell H, Jarl J. Socioeconomic inequalities in the kidney transplantation process: a registry-based study in Sweden. Transplant Direct. 2018;4(2):e346. https://doi.org/10.1097/TXD.0000000000000764

17. Zhang Y, Jarl J, Gerdtham UG. Are there inequities in treatment of end-stage renal disease in Sweden? A longitudinal register-based study on socioeconomic status-related access to kidney transplantation. Int J Environ Res Public Health. 2017;14(2):119. https://doi.org/10.3390/ijerph14020119

18. Farah SS, Alhaji MM, Ahmed D, Alam S, Johan NH, Zulkipli IN, et al. Barriers to kidney transplantation as a choice of renal replacement therapy. Transplantat Proc. 2018;50(10):3165-71. https://doi.org/10.1016/j.transproceed.2018.07.005

19. Barth A, Szollosi GJ, Nemes B. Factors Affecting Access to the Kidney Transplant Waiting List in Eastern Hungary. Transplantat Proc. 2021;S0041-1345(21)00078-6. https://doi.org/10.1016/j.transproceed.2021.01.044

20. Neves PDMM, Sesso RCC, Thomé FS, Lugon JR, Nascimento MM. Censo Brasileiro de Diálise: análise de dados da década 2009-2018. Braz J Nephrol. 2020;42(2):191-200. http://dx.doi.org/10.1590/2175-8239-jbn-2019-0234

21. Bayat S, Kessler M, Briancon S, Frimat L. Survival of transplanted and dialysed patients in a French region with focus on outcomes in elderly. Nephrol Dial Transplant. 2009;25(1):292-300. https://doi.org/10.1093/ndt/gfp469

22. Etges V. Mesorregiões brasileiras: o portal da metade Sul/RS-Mesosul. Redes. 2005;10(2):73-82. http://dx.doi.org/10.17058/redes.v10i2.11068

23. Fiori TP. Principais resultados do Idese 2016. Secretaria de Planejamento, Orçamento e Gestão. Departamento de Economia e Estatística. Available from: https://dee.rs.gov.br/upload/arquivos/202004/22153608-nt-12-idese.pdf

24. Niessen LW, Mohan D, Akuoku JK, Mirelman AJ, Ahmed S, Koehlmoos TP, et al. Tackling socioeconomic inequalities and non-communicable diseases in low-income and middle-income countries under the Sustainable Development agenda. Lancet. 2018;391(10134):2036-46. https://doi.org/10.1016/S0140-6736(18)30482-3

25. Frazão CMFQ, Ramos VP, Lira ALBC. Qualidade de vida de pacientes submetidos à hemodiálise. Rev Enferm UERJ. 2011;19(4):577-82.

26. Taylor DM, Fraser SD, Dudley C, Oniscu GC, Tomson C, Ravanan R, et al. Health literacy and patient outcomes in chronic kidney disease: a systematic review. Nephrol Dial Transplant. 2018;33(9):1545-58. https://doi.org/10.1093/ndt/gfx293

27. Garcia-Garcia G, Jha V. CKD in disadvantaged populations. J Bras Nefrol. 2015;37(1):14-18. https://doi.org/10.5935/0101-2800.20150003

28. Garcia-Garcia G, Martinez-Castellanos Y, Renoirte-Lopez K, Barajas-Murguia A, de la Torre-Campos L, Becerra-Muñoz LE, et al. Multidisciplinary care for poor patients with chronic kidney disease in Mexico. Kidney Int Suppl. 2013;3(2):178-83. https://doi.org/10.1038/kisup.2013.9

29. Qiao B, Liu L, Liu J, Xie J. A study on the attitude toward kidney transplantation and factors among hemodialysis patients in China. Transplant Proc. 2016;48(8):2601-7. https://doi.org/10.1016/j.transproceed.2016.06.060