Epidemiological profile of patients on the waiting list for renal transplantation

Perfil epidemiológico dos pacientes em lista de espera para o transplante renal

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Abstract

Objective: To identify and describe the profile of patients placed on a single waiting list for renal transplantation in the state of São Paulo.
Methods: Cross-sectional epidemiological study of quantitative approach to identify and describe the profile of patients placed on a single waiting list for renal transplantation. In the period from 2009 to 2015, a survey was conducted in the databases of the Notification, Collection and Distribution Center of Organs of the Single Technical Registry, and the following characteristics were established as variables: clinical, demographic and information related to the convocation result. The sample included 12,415 patients undergoing hemodialysis who were simultaneously registered for renal transplantation. The Chi-Square and Student's t-test were used for descriptive statistical analysis and the Kaplan-Meier estimate was used for significance.
Results: A total of 12,415 patients were included, mean age was 50 years, male gender (59.6%), white color (63.1%), blood type O (48.9%), metropolitan region of São Paulo (73.82%), unspecified diagnosis (34.5%), did not undergo transplantation (77.2%), and without clinical conditions to perform the transplant (99.8%).
Conclusion: Knowing the profile of patients with chronic kidney disease on the single waiting list allows the development of new health care strategies for reducing mainly morbidity and mortality rates. There is lack in meeting the care demands and high rates of refusal.

Resumo

Objetivo: Identificar e descrever o perfil dos pacientes inscritos em lista única de espera para a realização do transplante renal no estado de São Paulo.
Métodos: Estudo epidemiológico transversal com abordagem quantitativa para identificar e descrever o perfil dos pacientes inscritos em fila única de espera para o transplante renal. Realizou-se levantamento nas bases de dados da Central de Notificação, Captação e Distribuição de Órgãos do Cadastro Técnico Único, estabelecendo-se como variáveis as características clínicas, demográficas e relativas ao desfecho de convocação no período de período de 2009 a 2015. A amostra foi composta por 12.415 pacientes que realizavam hemodiálise e paralelo ao tratamento encontravam-se inscritos para a realização do transplante renal. Para análise estatística descritiva, utilizou-se os testes Qui-Quadrado, *t* de *Student* e para significância *Kaplan Meier*.
Resultados: Foram incluídos 12.415 pacientes, identificou-se média de idade de 50 anos, sexo masculino (59,6%), cor branca (63,1%), tipo sanguíneo O (48,9%), região metropolitana de São Paulo (73,82%), diagnóstico não especificado (34,5%), não realizaram transplante (77,2%) e sem condições clínicas de realizar o transplante (99,8%).
Conclusão: Conhecer o perfil dos pacientes com doença renal crônica que aguardam em lista única nos permite traçar novas estratégias de cuidados em saúde para redução principalmente das taxas de morbidade e mortalidade. Nota-se carência de atendimento da demanda e altos índices de recusa.

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Conflicts of interest: Although Roza BA is an Associate Editor of the Acta Paulista de Enfermagem, the manuscript of her co-authorship has been evaluated by experts not linked to her team. This measure ensures and guarantees scientific and ethics confidentiality explicit in the guidelines of this journal.

Introduction

Chronic kidney disease (CKD) has become increasingly important in Brazil. It is an increasingly common disease associated with high mortality and morbidity, and costs that impact negatively on health-related quality of life. The annual increase in number of new patients with end-stage renal disease requiring renal transplantation, and the growing gap between demand and supply of kidneys has led to the progressive expansion of the renal transplant waiting list globally. This has become a major problem, since many patients die while waiting to receive a kidney.[1-3]

In Brazil, the number of kidney transplants performed per year covers only an average of 30% of the total of people on the waiting list for this organ. Transplants are part of the budget of financial resources destined to the health sector, and Brazil has the largest public system of transplants in the world, financing more than 90% of surgeries performed by the Unified Health System (SUS - Sistema Único de Saúde). In the state of São Paulo, control of the convocation of registered candidates is performed by the Single Technical Registry (CTU), a computerized database of the State System of Transplants of São Paulo (SIGSET). This database stores receptors' information (active potentials, semi-active, removed, transplanted patients and deceased), notifications of donors in brain death and heart failure, effective organ and tissue donors, transplant medical staff, notification and transplant hospitals in the state, Organ Procurement Organizations (OPOs), and Intra Hospital Commissions of Organ and Tissue Donation for Transplantation (CIHT).[4-7]

The waiting list is the only option for kidney patients without contraindications and who cannot find a donor among their relatives up to the fourth degree of kinship, donation of spouses or anyone else. In all states of the federation, there is a single waiting list, organ allocation is regulated by specific legislation, controlled by the National Transplant System, and distribution is based on the HLA (Human Leucocyte Antigen) compatibility test.[1,2,7]

In the first half of 2016, the 120 kidney transplant centers recorded 2,651 transplants. In the whole year of 2015, were performed 5,556 kidney transplants, of which 1,172 were from a living donor, 4,384 from a deceased donor, 951 from relatives, 165 from non-relative/spouse, and 56 from non-relative/others. The southeast and south regions had the highest number of transplants performed, highlighting the state of São Paulo with a total of 1,983 procedures, leader in the number of renal transplant teams, with 33 active teams.[2]

The state of São Paulo is the largest in absolute number of transplants given the size of its population and the migration of patients from other states. Over the past three years, the numbers of effective donors and about 2,000 kidney transplants per year have remained stable, with 75% of deceased donors.[1,2] In São Paulo, it is possible to perform all types of transplants in numbers above the average of the region and the country. The objective of this study was to identify and describe the epidemiological profile of patients registered in the Single Registry of Renal Transplantation of the state of São Paulo from 2009 to 2015.

Methods

Cross-sectional epidemiological study with quantitative approach to identify and describe the profile of patients placed on a single waiting list for renal transplantation in the state of São Paulo. Data were collected from the Notification, Collection and Distribution of Organs Central (CNCDO 1) of the Single Technical Registry (CTU) between years 2009 and 2015. The following characteristics were established as variables: clinical (diagnosis and blood group), demographic (sex, age in years, race and origin) and related to the convocation result (performance of renal transplantation or not, and reasons for refusal).

The sample included 12,415 patients undergoing hemodialysis and simultaneously registered for renal transplantation. The collect-

ed data were extracted into a Microsoft Excel spreadsheet. Subsequently, was performed an analysis using the IBM® Statistical Package for social Science SPSS® 20.0 and the Data Analysis and Statistical Software STATA®, version 12.0. The loss of incomplete bank data and the elimination of duplicate information were not considered significant or a posing risk in the reflection of results obtained.

The associations between categorical variables were verified using the Chi-Square test. The comparison of two means was performed using the Student's t-test for independent samples. The Kruskal-Wallis nonparametric test, necessary for the analysis of variance - ANOVA, was used for the comparison of more than two means.

The survival functions were analyzed separately for each predictor variable (univariate analysis) by patient's characteristics. The Kaplan-Meier survival test was used for categorical variables. Subsequently, the Cox model (multivariate) was applied for the simultaneous evaluation of effects of all predictor variables on survival time. All predictor variables selected (race, ABO, diagnosis, sex, age and region) were included in the model.

The significance level was set at 5% for all statistical tests.

The study met the ethical standards for research involving human beings - Presentation Certificate for Ethical Appreciation (CAAE - *Certificado de Apresentação para Apreciação Ética*) Registration number 16300113.6.0000.5505.

Results

The sample consisted of 12,415 patients registered in the CTU in São Paulo to undergo renal transplantation. The mean age at the time of registration was 50.2 years (SD=15.3 years), with a minimum age of 2 years and maximum age of 98 years. The median of ages was 52 years.

The Chi-square test and the Student's t-test were used, and predominance of male patients was found with 59.6% of the sample ($p < 0.001$). In addition, 63.1% of the patients were white, 48.9% had blood type O, and 26.2% were from the city of São Paulo. Regarding disease diagnosis, 34.5% had umspecified etiology (Other), 28.2% presented Systemic Arterial Hypertension (SAH), and 20.8% had diabetes *mellitus* (DM), as shown in table 1.

Table 1. Analysis of patients by predictive characteristics

Variables	n(%)
Sex	12415(100.0)
Female	5016(40.4)
Male	7399(59.6)
Race	12415(100.0)
Asian	234(1.9)
White	7840(63.1)
Black	1528(12.3)
Mixed	2813(22.7)
Blood type	12415(100.0)
A	4393(35.4)
AB	419(3.4)
B	1528(12.3)
O	6075(48.9)
Diagnosis	12397(100.0)
Diabetes	2576(20.8)
Hypertensive arterial disease	3499(28.2)
Glomerulonephritis	1777(14.3)
Interstitial nephritis (pyelonephritis)	266(2.1)
Other	4279(34.5)
No information	18(0.1)
County	12415(100.0)
SP	3257(26.2)
Other	9158(73.8)

The discriminant analysis of variables demonstrates patients' distribution by refusals and transplant situation. In 6.9% of patients, there was at least one refusal before receiving the transplant. The percentage of transplants performed in the first offer was 15.9%, and registered candidates who did not receive nor undergo renal transplantation correspond to 77.2% (Figure 1).

A profile of the patients placed on the waiting list in the CTU of São Paulo can be traced based on the results found. The predominant clinical and demographic characteristics, and those related to the convocation result (if renal transplantation was performed or not) were evaluated and are presented below (Figure 2).
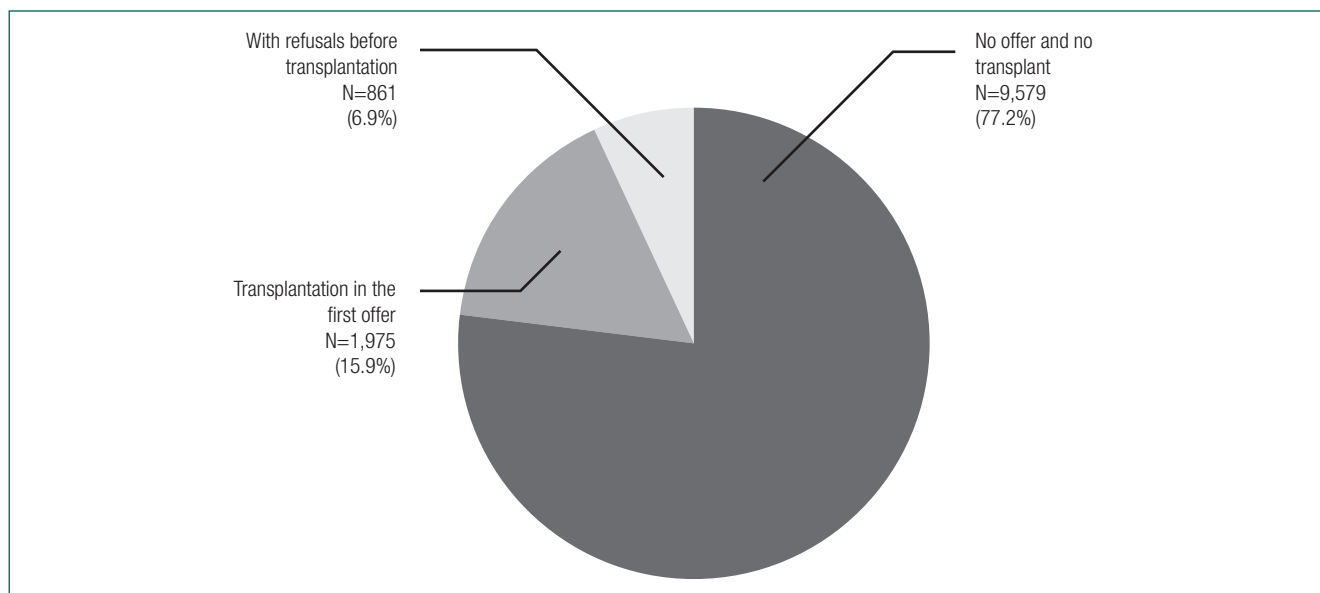
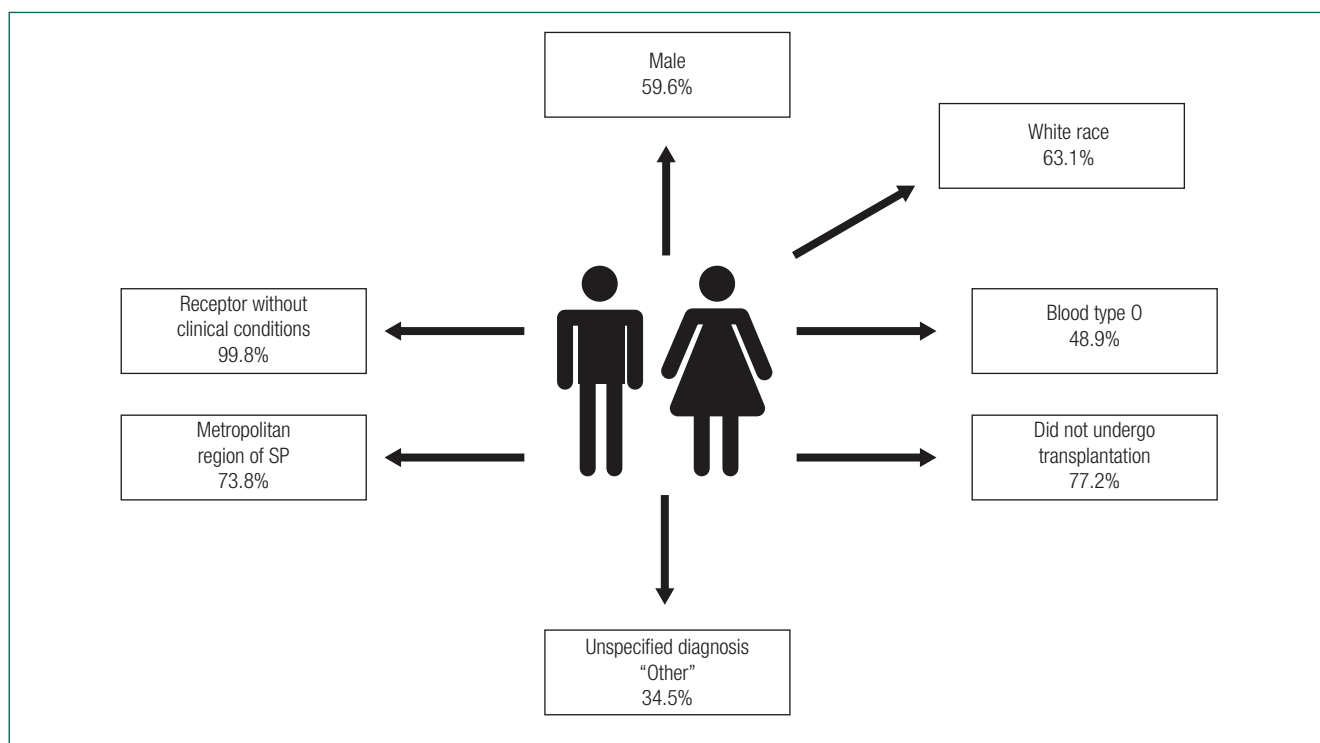**Figure 1.** Patients' distribution by refusals and transplant situation

Figure 2. Profile of patients registered in the renal single technical registry of São Paulo

Discussion

Some limitations of the study are related to the fact that it is a cross-sectional epidemiological analysis with limited execution time that excluded patients registered outside the established period. In the present study, issues on patients' awareness and adherence to treatment during their time on the waiting list were not controlled. In addition, the findings only cover the profile characterization of renal transplant candidates in the state of São Paulo.

Tracing the epidemiological profile of patients undergoing hemodialysis treatment in the

state of São Paulo allows a better understanding of the population on the waiting list for renal transplantation, the achievement of greater chances of success in the care provided, adequate follow up of treatment, and fewer occurrences in the period of adaptation to the new organ. In addition, it provides subsidies for health professionals' clinical practice in the improvement of services provided.

The results showed that most individuals registered on the CTU list were male (59.6%), aged between 51 and 60 years (mean age 50.2 years), minimum age of two years and maximum age of 98 years. Similar studies conducted in the south, southeast and northeast regions corroborate with these findings, in which it was observed that most patients registered with hemodialysis programs awaiting kidney transplant are over 50 years of age and predominantly male.[8]

Results of the Brazilian Society of Nephrology's 2015 Census also confirm that, out of a total of 111,303 patients in renal replacement therapy (RRT) in Brazil, the majority is aged between 45 and 62 years, and about 58% is male. Likewise, the survey of the Brazilian Chronic Dialysis Survey of 2014 found that 58% of patients with chronic kidney disease on the waiting list for renal transplantation are males with an age percentage corresponding to the present study.[9,10]

According to the Ministry of Health, men are more vulnerable to chronic diseases, particularly systemic arterial hypertension (SAH) and diabetes *mellitus* (DM), the main risk factors for CKD. In the daily routine of health services, it is observed empirically that men of working age seek less care than women, as women seek health services more often because of gynecological care. This fact may be related to male vulnerability and with propensity to suggest superiority on the waiting list for renal transplantation.[4,11-13]

In the present study, the underlying diagnosis 'Other' (unspecified) was the most frequent cause of chronic renal failure with 34.5%, followed by hypertension with 28.2%, DM with 20.8%, glomerulonephritis with 14.3%, and interstitial nephritis (pyelonephritis) with 2.1%. Similar epidemiological studies have shown that HAS and DM underlying diseases are commonly identified as the main primary diagnoses and responsible for about half of pathologies of patients undergoing dialysis treatment in Brazil. Causes of unknown etiology for CKD also appear constantly in the registries. Similar studies indicate DM is consistently the main cause in some northeastern states.[13-15]

In the evaluation of survival functions by patients' characteristics, was found the mean time of 63.4 months until the transplant using the Kaplan-Meier model, and the probability estimate of not undergoing transplantation in up to five years was 87.8%. In a detailed analysis of the relationship between underlying diagnoses by patients' sex, was found male prevalence in hypertensive arterial disease with 29.1%, and diabetes *mellitus* with 23.2%. The diagnosis of glomerulonephritis is predominantly observed in females with 16%, the same way as the diagnosis 'Other' that corresponds to 37.4% of the total. Among patients of both sexes who did not undergo transplantation, more than half presented DM as the underlying disease. Another study conducted by Malta et al.[17] confirms these results. A higher prevalence of hypertension and DM was found in male patients with CKD.[16,17]

In the ethnic group, there was predominance of the white race with 63.1% of the total, followed by mixed race with 22.7%, black race with 12.3% and Asians with 1.9%. However, data analysis demonstrates this feature is not necessarily related to transplantation because the assessment of clinical conditions of patients on the waiting list and their selection occur regardless of race thus, non-ethnic differences. Similar studies performed in the southeast and south regions presented similar results with predominance of white race by self-report.[18]

Blood type O patients had fewer transplants compared to patients from other blood type groups, which may be explained by the presence of anti-A and anti-B agglutinins in plasma. Regarding the ABO system, there is greater percentage of blood type O individuals on the single waiting list. This information is in line with

studies of Machado et al.,[5] and associated to the fact that blood type O individuals are compatible only with those of the same blood type group.[19]

Regarding the origin, most patients registered in the CTU came from the metropolitan region of São Paulo (78.3% of the total), while 26.2% were from the city of São Paulo. This is explained by the provision of services by the public health network through an agreement with SUS, with offer of ambulatory care before and after transplantation (mainly with supply of immunosuppressive drugs after renal transplantation), a specialized unit for hospitalization, surgical procedures, and high complexity diagnoses for treated patients.[3,11,17]

In view of these findings, it is important that patients entering RRT for renal transplantation are referred early (while they are on the single waiting list), because dialysis time may negatively influence the identification of a compatible donor and the time of survival of the transplanted organ. Health professionals should be attentive to improvements in the health care of renal patients in dialysis therapy. The clinical condition and development of comorbidities may inactivate the patient on the list or even definitively prevent him/her from undergoing renal transplantation.

Conclusion

By knowing the profile of the population on the single waiting list for kidney transplantation, new health care strategies can be developed to reduce mainly morbidity and mortality rates. There is lack in meeting the care demands and high rates of refusal. The conclusion is that the identification and analysis of patients' profile can support health professionals working in the clinical area by facilitating the management of activities developed in the field. The characterization of patients placed on the waiting list for renal transplantation is necessary in all transplant centers and renal replacement therapy treatment centers, because socio-populational aspects can determine the type of commitment resulting from chronic kidney disease, as well as their evolution in the period after renal transplantation.

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