Epidemiologic and Economic Aspects Related to Hemodialysis and Kidney Transplantation in Santa Catarina in the Period of 2012–2013

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ABSTRACT

Background. Chronic kidney disease (CKD) is a worldwide public health problem and is expressed by increasing amounts of patients on renal replacement therapy (RRT), with significant economic and social impacts. The aim of this work was to analyze socioeconomic and mortality aspects of CKD patients in Santa Catarina (SC), Brazil.

Methods. This was an ecologic study with the population of SC's CKD patients, who used RRT or underwent renal transplantation (RT) from 2012 to 2013. Data were obtained through electronic access to the information systems of the Brazilian Universal Health System, tabulated, and analyzed in the Statcalc software.

Results. The predominant therapy was hemodialysis (HD)—1–3 times per week—accounting for 97.62% of all procedures and 97.48% of the costs. RT from deceased donor (DD) was the most performed, with a frequency of 79.11%, and it was also responsible for the largest cost (81.78%). Mortality among patients in HD was higher in men (57.84%), and in the age group of 60–79 years ($P < .0001$). Among RT patients, mortality was also prevalent among men (75%) and in the age group of 50–64 years ($P < .057$).

Conclusions. Men, as well as older age groups, presented more prevalent mortality in HD and in RT. The costs of RRT were higher in HD and in RT from deceased donors and associated with its high prevalence.

CHANGES in mortality and fertility profiles occurred in developed countries in the course of the entire 20th century, and a similar phenomenon in Brazil, but faster, later, and still unfinished, occurred, called the "epidemiologic transition." This social process is characterized, in its demographic dimension, by a proportional increase of the elderly in total population and, in its epidemiologic dimension, by reduced child mortality and prevalence of infectious diseases, replaced by the predominance of mortality caused by noncommunicable diseases [1]. Many of these "new epidemics" have been controlled by the accelerated development of medical technology, which is the case with chronic kidney disease (CKD) [2], suggesting that the changes in the population health condition induced an organized social response to face these conditions through a health care system [3].

Arterial hypertension and diabetes mellitus constitute the main risk factors for CKD and are frequent in the general population, contributing to the high incidence of kidney damage, especially in late adulthood and the elderly [4]. The natural outcome of this pathology, however, was altered by the development of renal replacement therapy (RRT), such as hemodialysis, which allows the extension of life with some quality, and even healing with the advent of renal transplantation.

The treatment of renal failure is related to its evolution and comorbidities presented by the patient; and it considers prevention, monitoring, and intervention in complications and in other chronic diseases [5] to retard or even stop the advance of failure [6]. The final stage of CKD starts when the patient needs RRT to survive. The available RRTs are hemodialysis (HD), peritoneal dialysis (PD), and renal transplantation (RT) [7].

According to the Brazilian Society of Nephrology, it is estimated that there are 10 million people with some degree

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of CKD in the country, considering an estimated prevalence of 50 cases/100,000 inhabitants. Regarding the epidemiologic and clinical profile of patients on RRT in Brazil, it is predominant male and most patients are 45–64 years of age [8].

Currently, among developing countries, Brazil has the largest universal public health system in the world, which finances >80% of patients on HD and virtually every organ transplantation performed in the country [9]. In addition to the high economic cost of CKD, the social and psychologic repercussions and restriction in quality of life of patients submitted to RRT should also be taken into consideration [10].

The relevance of CKD and the social and economical importance of the RRT for maintenance of life of an increasingly significant amount of patients led to the present research, which sought to characterize, economically and epidemiologically, this problem in the state of Santa Catarina, Brazil, in the period of 2012–2013.

METHODS

This was an observational ecologic study with the use of descriptive and analytic statistics. The study was contextualized within public health policies in Brazil and developed with the use of data from the information systems of the Universal Health System (SUS) related to the procedures of interest to this study: RRT and RT.

The population covered was composed of chronic renal failure (CRF) patients >20 years old who used RRT (hemodialysis), or >18 years who underwent kidney transplantation (from deceased donors), funded by the SUS, in the years 2012 and 2013 in Santa Catarina, Brazil.

The survey data also included complications (CRF deaths occurring during the study period and deaths occurring in transplant patients an average of up to 2 years after the transplantation) and the frequency and cost of the procedures studied, which were tabulated, transferred, and organized in Microsoft Excel spreadsheets. To calculate mortality rates, we used the Statcalc program, and the data in Excel were exported to the SPSS 18.0 program for statistical analyses.

Association measures, the relative risk, the confidence interval, and P values were calculated when appropriate, and comparisons between the calculated rates were carried out by applying the chi-square test, with a confidence level of 5% ($P < .05$).

RESULTS

In Santa Catarina, in the biennium 2012–2013, an average of 6,363 patients/year were recorded to be in HD, with an average of 153 deaths/year. During the same period (2012–2013), there 427 RTs were performed, an average of 213.50/year. From that time period, 48 deaths occurred among transplant patients. The deaths of both HD as RT patients were evaluated according to sex and age. In addition, information related to the costs of such procedures was collected, as presented in Table 1.

Regarding Table 1, it was observed that HD (1–3 sessions/week) has been the most frequent and important procedure in terms of cost, accounting for 97.62% of the procedures performed, averaged over the years 2012–2013, and 97.48% of financial expenses in the period studied.

Regarding RT, deceased-donor transplantation was the most frequent, accounting for 79.11% of the procedures performed during the study period, and almost 82% (US$ 3,590,033.44) of the costs with this type of procedure, considered the average of the years 2012 and 2013, noted in Table 1.

Regarding HD, men had a higher number of deaths, accounting for 177 deaths (57.84% of total), with an average mortality rate of 24.61 per 1,000 men undergoing the procedure and a relative risk of mortality 5% higher than women during the study period. The mortality of patients undergoing HD was strongly related to age: Deaths in the age group of 60–79 years were the most prevalent (43.79%), and the relative risk of mortality among HD patients >80 years of age was ≥72 times that of the age group of 20–39 years. Only the age groups of 60–79 years and >80 years showed strong statistical significance ($P < .0001$), shown in Table 2.

Regarding Table 2, RT mortality was also greater in men, representing 75% of the deaths that occurred during the study period and a mortality relative risk 14% higher than in women. The relative risk of death among RT patients in the age group of >65 years was 5.88 times higher than that of the age group of 18–34 years ($P < .001$). The mortality of the age groups >65 years was statistically significant ($P < .015$).

Table 1. Frequency and Cost of Dialysis and Renal Transplantation Procedures, Santa Catarina 2012–2013

Procedure	Average *n* (%)	Average Cost, US$ (%)	Average Unit Cost, US$
Hemodialysis (1–3/wk)	323,027 (97.62)	27,179,974.30 (97.48)	84.14
Hemodialysis, HIV	3,697.5 (1.12)	462,431.83 (1.66)	125.07
Arteriovenous fistula	992 (0.30)	119,117.23 (0.43)	120.08
Implant catheter	1,513.5 (0.46)	42,017.11 (0.15)	27.76
Catheter double lumen	1,654.5 (0,50)	78,555.14 (0.28)	47.48
Total dialysis	330,884 (100)	27,882,095.63 (100)	84.26
Deceased-donor transplantation	195 (79.11)	3,590,033.44 (81.78)	18,410.43
Living-donor transplantation	42 (17.04)	538,676.66 (12.27)	12,825.63
Pancreas/kidney transplantation	9.5 (3.85)	261,060.60 (5.95)	27,480.06
Treatment complications	174.5	219,630.71	1,258.63
Total transplantation*	246.5 (100.00)	4,389,770.70 (100.00)	17,808.40

*The frequency and proportion did not include the treatment of complications.
Source: SIA/APAC Nefro/DATASUS and National Transplant System, adapted by the author.