Latin American Dialysis and Transplant Registry: 2008 prevalence and incidence of end-stage renal disease and correlation with socioeconomic indexes

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In 2008, 563,294,000 people were living in Latin America (LA), of which 6.6% were older than 65. The region is going through a fast demographic and epidemiologic transition process, in the context of an improvement in socio-economic indices. The Latin American Dialysis and Renal Transplant Registry has collected data since 1991, through an annual survey completed by 20 affiliated National Societies. Renal replacement treatment (RRT) prevalence and incidence showed an increase year by year. The prevalence rate (in all modalities) correlated with the World Bank country classification by income and the epidemiologic transition stage the countries were experiencing. RRT prevalence and kidney transplantation rates correlated significantly with gross national income (GNI), health expenditure in constant dollars (HeExp), % older than 65, life expectancy at birth, and % of the population living in urban settings. Kidney transplantation increased also, year by year, with more than 50% of transplants performed using kidneys from deceased donors. Double transplants were performed in six countries. RRT prevalence and incidence increased in LA, and are associated with indexes reflecting higher and more evenly distributed national wealth (GNI and HeExp), and the stage of demographic and epidemiological transition.

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INTRODUCTION

Latin America (LA) is a region extending from Mexico and the Caribbean Islands in the north to Argentina and Chile in the south. It is characterized by the use of languages (Spanish and Portuguese) and a wide ethnic diversity. In this true melting pot, the original immigrants from Spain and Portugal are now admixed with European immigrants who escaped from the World Wars, with Native Americans (now the majority in Bolivia and in very high numbers in Guatemala, Peru, and Mexico) and the descendants of the slaves migrating from Africa (very high numbers in Brazil; fewer in Colombia and Uruguay). The racial admixture in Brazil is so big that genetic studies arrived at the conclusion that skin color cannot identify the race. Most of them are mulattos (pardos in the vernacular); in Uruguay the mix with predominantly Spaniards is the rule. Usually, father genes are Spanish or Portuguese. In Uruguay an author wrote: 'The data show that almost every population is dihybrid or trihybrid, and when African influence is not detected, it is probably due more to the method than to an absence of that contribution'.

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This has turned each Latin American country into a nation with its own unique ethnic and cultural characteristics.

The region is now going through a fast demographic and epidemiologic transition process, characterized by a reduction in mortality and birth rates, accompanied by rapid lifestyle changes. This is associated with the populations’ movements from rural areas to big cities, with an increase in chronic non-communicable diseases, while the fight continues against infections, especially emerging and re-emerging diseases such as dengue and Chagas disease. Argentina, Chile, Uruguay, and Cuba have already largely completed their demographic and epidemiologic transition.²

In 2008 there were 563,294,000 people living in LA.³ The annual population growth was estimated to be 1.1% per year and 6.6% of the population were older than 65.⁴

From the socioeconomic point of view, significant improvements have occurred in the last 10 years: an increased gross national income (GNI), from 3683 USD in the year 2001 to 6837 USD in 2008; an increased life expectancy at birth, from 71.6 (2000) to 73.6 (2008); a lower percentage of people living below the poverty line, from 43.8% in 1999 to 35.1% in 2007; and also a decreased percentage of people living below the absolute poverty line, from 18.5% in 1999 to 12.7% in 2007.⁵ The mean health expenditure per capita was 717.5 USD (range 218–1322) in 2008.³

The Latin American Society of Nephrology and Hypertension is represented in 20 countries covering 99% of the Latin American population (see Table 1).

The Latin American Dialysis and Renal Transplant Registry (LADRTR), which has been collecting data since 1991, has allowed greater understanding of the epidemiologic trends in end-stage renal disease (ESRD) treatment and their correlation with socio-economic variables.

This paper presents the results corresponding to year 2008.

METHODS

The participant countries complete an annual survey requesting data on incident and prevalent patients undergoing renal replacement treatment (RRT) in all modalities: hemodialysis (HD), peritoneal dialysis (PD) and living with a functioning graft (LFG), the number of kidney transplants performed and donor type, number of dialysis and transplant centers, etc. Based on these data, prevalence and incidence rates are established.

Prevalence and incidence rates were correlated with:
1. the World Bank (WB) country classification according to the income in 2008: low income (less than US$996: no Latin American country included in this group); low medium income (US$996–3945) (Ecuador, El Salvador, Guatemala, Honduras, Nicaragua, Paraguay, Bolivia); high medium income (US$3946–12,195) (Argentina, Brazil, Chile, Colombia, Costa Rica, Cuba, Mexico, Panama, Peru, Dominican Republic, Uruguay, Venezuela); and high income (US$>12,195) (only Puerto Rico);
2. the epidemiologic transition stage: stage 2, moderate (Guatemala and Bolivia), stage 3, full (Colombia, Ecuador, El Salvador, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Dominican Republic, Venezuela), and stage 4, advanced and very advanced (Argentina, Brazil, Chile, Costa Rica, Cuba, Uruguay, Puerto Rico);⁵
3. the GNI;
4. the health expenditure in constant dollars (HeExp);
5. the life expectancy at birth;
6. the % of inhabitants older than 65;
7. the % of the population living in urban settings.

For the statistical analysis, the Pearson (r) and determination (r²) coefficients were applied and a P<0.05 was considered significant.

RESULTS

The prevalence of ESRD under RRT in LA increased from 119 patients per million population (pmp) in 1991 to 568 pmp in 2008 (HD 342 pmp, PD 119 pmp, and LFG 106 pmp). The highest rates were reported by Puerto Rico (1170), Uruguay (1079), and Chile (1036) (in pmp), with a wide variability among countries (see Table 1).

According to the WB country classification based on income, in Latin American Countries, HD, PD, and LFG prevalences were, respectively, 160, 91, and 23 pmp in low-income countries; 360, 124, and 116 pmp in low-medium-income countries; and 997, 80, and 92 pmp in high-medium-income countries.

Regarding the epidemiologic transition, it is divided into four stages: (1) characterized by high fertility and mortality rates, resulting in low growth of the population; (2) a reduction in mortality due to advances in medicine and development of public health, with maintenance of fertility, leading to an increase in life expectancy at birth and a sustained increase of the population; (3) both fertility and mortality declines—population growth continues to increase but at a slower rate, and life expectancy continues to rise; (4) considered the end of the transition—mortality and fertility rates are low, life expectancy at birth is over 65 years, population growth is stabilized or markedly reduced.²

According to the epidemiologic transition stage based on which Latin American countries are classified, the HD, PD, and LFG rates were, respectively, 104, 84, and 27 pmp for stage 2; 244, 207, and 43 pmp for stage 3; and 463, 39, and 175 pmp for stage 4.

The total RRT prevalence correlated positively with GNI (P = 0.000); HeExp (P = 0.007); % of population older than 65 (P = 0.000); life expectancy at birth (P = 0.044); and the % of urban population (P = 0.000). The HD prevalence correlated significantly with the same indexes, while the PD rate showed no correlation with any of the variables under analysis.

The incidence grew from 27.8 in 1992 to 207.6 pmp in 2008. In the years 2007/2008, data were sent by 13 countries comprising 91% of the Latin American population (Mexico, Puerto Rico, Honduras, Chile, Cuba, Uruguay, Brazil, Colombia, Argentina, Venezuela, Ecuador, Bolivia, Peru). A wide rate variation in incidence is observed—from 430.5 in Mexico to 30.6 pmp in Peru. A tendency to rate stabilization...
In 2008, this rate correlated significantly only with GNI (P = 0.029).

The kidney transplant rate increased from 3.7 pmp in 1987 to 6.9 pmp in 1991 and to 17.1 in 2008, although it showed remarkable variations in that year, from 36 pmp in Uruguay to 3 pmp in Peru. A total of 223 double kidney-pancreas transplants were performed (Brazil 134, Argentina 76, Colombia 5, Cuba 1, Uruguay 6, and Mexico 1). The kidney transplant rate for all transplants correlated positively with GNI (P = 0.023), HeExp (P = 0.000), health expenditure as % of GNI (P = 0.038), % of population older than 65 (P = 0.001), life expectancy at birth (P = 0.032), and % of urban population (P = 0.000). The total number of transplants in 2008 was 9288, with 53% deceased donors (the highest percentages were observed in Argentina (80%), Cuba (94.4%), Uruguay (94.1%), and Colombia (91%)). Owing to the higher population, numerically, a higher number was registered in Brazil, with 2033 kidney transplants, but in percentage it was only 54%.

**DISCUSSION**

The prevalence and incidence of ESRD have increased in every Latin American country, but with wide variations between them. Although it is true that variations are partly derived from the fact that some countries still lack full health coverage (as is the case, for instance, in Paraguay, Bolivia, and Peru), it is also true that prevalence growth is associated with higher and more evenly distributed national wealth (evaluated by GNI, by its location in the WB income classification, and by the HeExp). It also correlates with the demographic and epidemiologic transition stage, as shown by the higher rates in countries where life expectancy, % of inhabitants older than 65, and urbanization are also higher. Regarding prevalence of dialysis modalities, HD correlated with similar indexes, but PD did not. The non-correlation of PD rates could be related to other variables, such as differences in nephrologists’ training, a reduced acceptance of diabetic or elderly patients, or differences in the cost/revenue relationship.

The 18-year ongoing data collection is LADRTR’s major strength and has allowed construction and analysis of trends, and correlations with socio-economic indexes. Even though not all the countries have sent reports each year, those that did were those where most of the Latin American population lives, and the methodology used has been similar year to year, so that Latin American data on RRT are consistent.

Among its limitations, it has to be said that the data collected from each country are on a global basis and provided voluntarily by the local Societies of Nephrology (only Argentina, Cuba, and Uruguay keep dialysis and transplant records on a compulsory basis); moreover, information has not always been sent by all the countries for the last 18 years and, in some cases, the available data from a province or region are extrapolated to the whole country (e.g. Mexico); finally, the number of LFG patients in many countries is estimated.

In spite of its weaknesses, this Registry has allowed us to observe the ESRD treatment tendencies in LA. This knowledge has been publicly disclosed through consecutive publications. These have contributed to the development of national and sectoral registries in different countries that formerly did not collect such data, and to the design of health

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**Table 1 | LADTR: countries, population, socioeconomic indexes, and prevalence and incidence rates 2008**

| Country       | Population in millions | % over 65 years old | Health expenditure in constant dollars 2007 | GNI         | % Urban population | HD       | PD       | LKG       | Total RRT | Incidence rate | No. kidney Tx | % Dead donors | Kidney Tx rate |
|---------------|------------------------|---------------------|---------------------------------------------|-------------|-------------------|----------|----------|----------|-----------|----------------|-------------|---------------|---------------|
| Argentina     | 39,393                 | 10.5                | 1322                                        | 7160        | 75                | 92       | 595      | 25        | 132       | 752            | 142         | 998           | 80            |
| Bolivia 2007  | 9,694                  | 4.6                | 219                                         | 1450        | 66                | 65.58    | 98       | 18        | 17        | 133            | NR          | 79            | 48            |
| Brazil        | 192,004                | 6.4                | 799                                         | 7440        | 72                | 85.8     | 404      | 42        | 182       | 629            | 144         | 3780          | 54            |
| Chile         | 16,804                 | 8.7                | 768                                         | 9510        | 79                | 88.44    | 811      | 41        | 184       | 1036           | 172         | 282           | 73            |
| Colombia 2007 | 45,011                 | 5.2                | 516                                         | 4600        | 73                | 74.2     | 265      | 125       | 45        | 435            | 143         | 715           | 91            |
| Costa Rica    | 4,518                  | 6.0                | 878                                         | 5060        | 79                | 62.74    | 26       | 11        | 257       | 294            | NR          | 114           | 39            |
| Cuba          | 11,202                 | 11.2               | 1001                                        | 5550        | 79                | 75.64    | 206      | 12        | 93        | 311            | 87          | NR            | 144           |
| Ecuador       | 13,485                 | 6.3                | 434                                         | 3730        | 75                | 64.92    | 263      | 17        | 10        | 291            | 38          | 57            | 39            |
| El Salvador   | 6,133                  | 7.0                | 402                                         | 3460        | 71                | 60.7     | 121      | 347       | 63        | 531            | NR          | 28            | 0             |
| Guatemala     | 13,689                 | 4.3                | 336                                         | 2670        | 70                | 48.58    | 109      | 130       | 34        | 273            | NR          | 85            | 16            |
| Honduras      | 7,326                  | 4.2                | 260                                         | 1780        | 72                | 47.88    | 165      | 16        | 2         | 183            | 195         | 18            | 0             |
| Mexico        | 108,468                | 6.2                | 823                                         | 10,000      | 75                | 77.2     | 269      | 384       | 56        | 709            | 431         | 2259          | 25            |
| Nicaragua 2005| 5,675                  | 4.4                | 258                                         | 1050        | 73                | 56.74    | 10       | 22        | 3         | 35             | NR          | 4             | 0             |
| Panama        | 3,399                  | 6.3                | 773                                         | 6280        | 76                | 73.2     | 244      | 76        | 43        | 363            | 131         | 25            | 56            |
| Paraguay 2006 | 6,238                  | 4.9                | 253                                         | 2130        | 72                | 60.3     | 80       | 2         | 9         | 92             | NR          | 27            | 19            |
| Peru          | 28,836                 | 5.7                | 327                                         | 3990        | 73                | 71.3     | 189      | 35        | 42        | 266            | 31          | 80            | 0             |
| Puerto Rico   | 3,958                  | 13.4               | 33,259                                     | 7940        | 79                | 98.32    | 997      | 80        | 92        | 1170           | 338         | 94            | 80            |
| Dominican Rep.| 9,638                  | 5.9                | 411                                         | 4340        | 73                | 69.02    | 119      | 12        | 15        | 146            | NR          | 102           | 7             |
| Uruguay       | 3,350                  | 13.7               | 994                                         | 8020        | 76                | 92.3     | 757      | 68        | 254       | 1079           | 165         | 119           | 94            |
| Venezuela 2007| 28,121                 | 5.3                | 641                                         | 9170        | 74                | 93.66    | 292      | 72        | 34        | 399            | 120         | 278           | 64            |
| Total no. of countries, LA | 557,488              | 6.63              | 718                                         | 7012        | 73                | 78.57    | 342      | 119       | 106       | 568            | 208         | 9288          | 53            |

Abbreviations: GNI, gross national income; HD, hemodialysis; LA, Latin America; LADTR, Latin American Dialysis and Transplant Registry; LKG, living with a kidney functioning graft; NR, not reported; PD, peritoneal dialysis; RRT, renal replacement treatment; Tx, transplant.
policies aimed at improving the diagnosed patients’ coverage, such as higher health insurance coverage (Mexico and Ecuador), laws ensuring full coverage for RRT for patients in the social security system (Argentina, Uruguay, Chile, and Brazil), and the public health system assuming the cost of dialysis and transplantation of people without health coverage (Chile and Brazil).

Despite the regional economic improvement, there will continue to be an increased ESRD prevalence, associated with a higher life expectancy and increase in the older population. Thus, there will still be a requirement for the establishment of disease prevention and RRT programs, both to assist with the early diagnosis of renal disease and to provide treatment, for the inevitable increase in the number of patients with ESRD. An effective renal registry will be of considerable assistance in achieving these goals.

DISCLOSURE
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