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

Ana M. Cusumano[1], Guillermo Garcia-Garcia[2], Maria C. Gonzalez-Bedat[3], Sergio Marinovich[4], Jocemir Lugon[5], Hugo Poblete-Badal[6], Susana Elgueta[6], Rafael Gomez[7], Fabio Hernandez-Fonseca[8], Miguel Almaguer[9], Sandra Rodriguez-Manzano[10], Nelly Freire[11], Jorge Luna-Guerra[12], Gaspar Rodriguez[13], Tommaso Bochicchio[14], Cesar Cuero[15], Dario Cuevas[16], Carlos Pereda[17] and Raul Carlini[18]

[1]Executive Board of the Latin American Dialysis and Transplant Registry (LADTR), Argentina; [2]Executive Board of the Latin American Dialysis and Transplant Registry (LADTR), México; [3]Executive Board of the Latin American Dialysis and Transplant Registry (LADTR), Uruguay; [4]Delegates to the LADTR from National Societies of Nephrology from Argentina; [5]Delegates to the LADTR from National Societies of Nephrology from Brazil; [6]Delegates to the LADTR from National Societies of Nephrology from Chile; [7]Delegates to the LADTR from National Societies of Nephrology from Colombia; [8]Delegates to the LADTR from National Societies of Nephrology from Costa Rica; [9]Delegates to the LADTR from National Societies of Nephrology from Cuba; [10]Delegates to the LADTR from National Societies of Nephrology from Dominican Republic; [11]Delegates to the LADTR from National Societies of Nephrology from Ecuador; [12]Delegates to the LADTR from National Societies of Nephrology from Guatemala; [13]Delegates to the LADTR from National Societies of Nephrology from Honduras; [14]Delegates to the LADTR from National Societies of Nephrology from México; [15]Delegates to the LADTR from National Societies of Nephrology from Panama; [16]Delegates to the LADTR from National Societies of Nephrology from Paraguay; [17]Delegates to the LADTR from National Societies of Nephrology from Peru and [18]Delegates to the LADTR from National Societies of Nephrology from Venezuela

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.

Kidney International Supplements (2013) **3,** 153–156; doi:10.1038/kisup.2013.2

KEYWORDS: ESRD prevalence; dialysis and transplant registry; Latin America

Correspondence: *Ana M. Cusumano, Executive Board of the Latin American Dialysis and Transplant Registry (LADTR), Guemes 3848, 2do A, Ciudad Autónoma de Buenos Aires CP 1425, Argentina.*
E-mail: anacusumano@yahoo.com.ar or amcusumano40@gmail.com

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'.[1]

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;[3] an increased life expectancy at birth, from 71.6 (2000) to 73.6 (2008);[3] 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);[2]
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 (r^2) 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

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

							Prevalence rates p.m.p.							
Country	Population in millions	% over 65 years old	Health expenditure in constant dollars 2007	GNI	Life expectancy at birth	% Urban population	HD	PD	LKG	Total RRT	Incidence rate	No. kidney Tx	% Dead donors	Kidney Tx rate
Argentina	39.939	10.51	1322	7160	75	92	595	25	132	752	142	998	80	25
Bolivia 2007	9.694	4.66	219	1450	66	65.58	98	18	17	133	NR	79	48	8
Brazil	192.004	6.44	799	7440	72	85.58	404	42	182	629	144	3780	54	20
Chile	16.804	8.76	768	9510	79	88.44	811	41	184	1036	172	282	73	16.8
Colombia 2007	45.011	5.25	516	4610	73	74.2	265	125	45	435	143	715	91	16
Costa Rica	4.518	6.06	878	6060	79	62.74	26	11	257	294	NR	114	39	25
Cuba	11.202	11.21	1001	5550	79	75.64	206	12	93	311	87	144	94	13
Ecuador	13.485	6.36	434	3730	75	64.92	263	17	10	291	38	57	39	4
El Salvador	6.133	7.04	402	3460	71	60.7	121	347	63	531	NR	28	0	5
Guatemala	13.689	4.36	336	2670	70	48.58	109	130	34	273	NR	85	16	6
Honduras	7.326	4.24	260	1780	72	47.88	165	16	2	183	195	18	0	2
Mexico	108.468	6.23	823	10,000	75	77.2	269	384	56	709	431	2259	25	21
Nicaragua 2005	5.675	4.43	258	1050	73	56.74	10	22	3	35	NR	4	0	1
Panama	3.399	6.38	773	6280	76	73.2	244	76	43	363	131	25	56	7
Paraguay 2006	6.238	4.99	253	2130	72	60.3	80	2	9	92	NR	27	19	4
Peru	28.836	5.73	327	3990	73	71.3	189	35	42	266	31	80	0	3
Puerto Rico	3.958	13.34		33,259	79	98.32	997	80	92	1170	338	94	80	24
Dominican Rep.	9.638	5.90	411	4340	73	69.02	119	12	15	146	NR	102	7	11
Uruguay	3.350	13.74	994	8020	76	92.3	757	68	254	1079	165	**119**	94	36
Venezuela 2007	28.121	5.33	641	9170	74	93.66	292	72	34	399	120	278	64	10
Total no. of countries, LA	557.488	6.63	718	7012	73	78.57	342	119	106	568	208	9288	53	17

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.

was noticed in Argentina, Chile, Uruguay, and Puerto Rico. 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

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
The authors received support from SLANH, Latin American Society of Nephrology and Hypertension. AMC has received consulting fees from Astra/Zeneca. GG-G has received consulting fees from Gerson Lehrman Group and lecture fees from Roche. FH-F has received lecture fees from Abbott Laboratories. The remaining authors declared no competing interests.

ACKNOWLEDGMENTS
Publication of this article was supported in part by the National Health and Medical Research Council of Australia through an Australia Fellowship Award (#511081: theme Chronic Disease in High Risk Populations) to Dr Wendy Hoy, and the National Institutes of Health—NIDDK DK079709, NCRR RR026138, and NIMHD MD000182.

REFERENCES

1. Sans M. Admixture studies in Latin America: from the 20th to the 21st century. *Hum Biol* 2000; **72**: 155–177.
2. Latin America and the Caribbean. Demographic Observatory Year IV, April 2009. 2. Demographic transition and tendencies in ageing. P10. 2011 Available at http://www.eclac.cl/publicaciones/xml/7/38297/OD7_Proyeccion_Poblacion.pdf (accessed 20 October 2011).
3. Data-The World Bank. http://data.worldbank.org/region/latin-america-and-caribbean (accessed 20 October 2011).
4. Latin America and the Caribbean. Demographic Observatory Year IV, April 2009. Total population of the region by country and calendar year 1990–2030. Table 1b. 2011. Available at http://www.eclac.cl/publicaciones/xml/7/38297/OD7_Proyeccion_Poblacion.pdf.
5. Leon A. Progress in the reduction of extreme poverty in Latin America. Dimensions and policies for the analysis of the first millennium goal (in Spanish). Available at http://www.eclac.org/publicaciones/xml/6/33936/Pobreza_extrema_ALeon_final.pdf (accessed 20 October 2011).