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The Spanish Renal Registry: 2013 report and evolution from 2007 to 2013☆

Eduardo Martín Escobar, Registro Español de Enfermos Renales (REER)◊

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ABSTRACT

The purpose of the study is to show the evolution of renal replacement therapy (RRT) in Spain from 2007 to 2013.

Aggregated data and individual patient records were used from participating regional renal disease registries and that National Transplant Organisation registry. The reference population was the official population on January 1st of each year studied. Data on incidence and prevalence were based on aggregated data, while the survival analysis was calculated from individual patient records. The study period was 2007–2013 for prevalence, incidence and transplantation, and survival was analysed for 2004–2012. The population covered by the registry was a minimum of 95.3–100% of the Spanish population for aggregated data. The EU27 age and gender distributions of the European population for 2005 were used to adjust incidence and prevalence for age and gender. Survival probabilities were calculated for incident patients between the years 2004 and 2013 using the Kaplan–Meier method to calculate unadjusted patient survival probability. The log rank test was applied to compare survival curves according to some risk factors. Cox proportional hazards model was created to study the potential predictors of survival.

In 2013, the total number of patients in Spain that started RRT was 5705 for 95.3% of the total Spanish population, with an unadjusted rate of 127.1 PMP. The evolution from 2007 to 2013 showed a gradual decline from 127.4 PMP in 2007 to 120.4 PMP in 2012, with a small upturn to 127.1 in 2013. The adjusted incidence rate for the year 2013 was 121.5 PMP for the total population, 158.7 PMP for males and 83.1 PMP for females. The most frequent cause of primary renal disease in incident was diabetes mellitus: 20.4% in 2007, which increased to 24.6% in 2013. The percentage of transplant as first RRT increased from 1.7% in 2007 to 4.2% in 2013. The total number of patients in RRT for 95.3% of the population in 2013 was 50,567, with an unadjusted prevalent rate of 1125.7 PMP. The adjusted prevalence rate for 2013 was 1087.5 PMP (1360.7 PMP for males and 809.8 PMP for females). The percentage of diabetes mellitus in prevalent patients evolved from 13.9% in 2007 to 14.9% (168 PMP) in 2013. The percentage of transplanted prevalent patients with functioning grafts evolved from 49.3% in 2007 to 51.5% in 2013. The number of transplantations performed each year increased from 2211 (48.9 PMP) in 2007 (6.2% living donor transplants) to 2552 (54.2 PMP) in 2013 (15.0% living donor transplants).

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E-mail address: emartine@senefro.org

◊ The names of the components of the Registro Español de Enfermos Renales (REER) are listed in Annex 1.

40,394 patients from 12 regions of Spain who began RRT between 2004 and 2012 were included in the survival analysis (87% Spanish population coverage). Unadjusted patient survival probabilities after one, 2 and 5 years were 91, 81 and 57%, respectively. In the univariate analysis, better survival was found for non-diabetic patients, women, age below 45, peritoneal dialysis as first RRT and patients who had received at least one transplant.

Registro Español de Enfermos Renales. Informe 2013 y evolución 2007-2013

RESUMEN

Palabras clave:
Enfermedad renal crónica terminal
Tratamiento renal sustitutivo
Incidencia
Prevalencia
Trasplante renal
Supervivencia

El objetivo del estudio es mostrar la evolución del TRS en España desde 2007 hasta 2013.

Se utilizaron datos agregados y registros individuales de pacientes de los registros de enfermedades renales de las comunidades autónomas participantes, y el registro de la Organización Nacional de Trasplantes. La población de referencia fue la población oficial a 1 de enero de cada año estudiado. La incidencia y la prevalencia se basan en datos agregados, mientras que el análisis de supervivencia se calculó a partir de registros individuales. El período de estudio fue 2007-2013 para prevalencia, incidencia y trasplante; y 2004-2012 para el análisis de supervivencia. La población cubierta por el registro fue un mínimo del 95,3-100% de la población española para datos agregados. La distribución de edad y sexo de la población europea (UE-27) para el año 2005 se utilizó para ajustar incidencia y prevalencia. Se calcularon las probabilidades de supervivencia de los pacientes incidentes entre 2004 y 2013, utilizando el método de Kaplan-Meier para calcular la probabilidad de supervivencia sin ajustar. Las curvas de supervivencia se compararon mediante log rank test de acuerdo con algunos factores de riesgo. Se construyó un modelo proporcional de Cox para estudiar los posibles predictores de supervivencia.

En 2013 el número total de pacientes en España que iniciaron TRS fue de 5.705 para un 95,3% del total de la población española; con una tasa no ajustada de 127,1 pmp. La evolución desde 2007 hasta 2013 mostró una disminución gradual, de 127,4 pmp en 2007 a 120,4 pmp en 2012, con un pequeño repunte a 127,1 en 2013. La incidencia ajustada para el año 2013 fue de 121,5 pmp total, 158,7 pmp para hombres y 83,1 pmp para mujeres. La causa más frecuente de enfermedad renal primaria en incidentes fue la diabetes mellitus: el 20,4% en 2007, aumentando al 24,6% en 2013. El porcentaje de trasplante, como primera TRS, aumentó del 1,7% en 2007 al 4,2% en 2013. El número total de pacientes en TRS, respecto al 95,3% de la población, en 2013 fue de 50.567, con una tasa de prevalencia no ajustada de 1.125,7 pmp. La tasa de prevalencia ajustada para 2013 fue 1.087,5 pmp, 1.360,7 pmp para varones y 809,8 pmp para mujeres. El porcentaje de diabetes mellitus en pacientes prevalentes evolucionó del 13,9% en 2007 al 14,9% en 2013. El porcentaje de pacientes prevalentes trasplantados y con injerto funcionante pasó del 49,3% en 2007 al 51,5% en 2013. El número de trasplantes realizado cada año aumentó de 2.211 (48,9 pmp) en 2007, con un 6,2% de trasplantes de donante vivo, a 2.552 (54,2 pmp) en 2013, con un 15% de trasplantes de donante vivo.

Se incluyeron en el análisis de supervivencia 40.394 pacientes procedentes de 12 regiones que comenzaron su TRS entre 2004 y 2012 (un 87% de cobertura de la población española). Las probabilidades de supervivencia sin ajustar de los pacientes, a uno, 2 y 5 años, fueron del 91, 81 y 57% respectivamente. En el análisis univariado se encontró una mejor supervivencia en pacientes no diabéticos, de sexo femenino, edad inferior a 45 años, siendo la diálisis peritoneal el primer TRS y que hubieran recibido al menos un trasplante.

Introduction

Since the publication of the 2006 Spanish Renal Registry (REER) report in NEFROLOGÍA[1] in 2009, we have not published any additional report, although we have presented a yearly report at the Spanish Society of Nephrology (SEN) Congress. Also the information has been available in the website of the SEN[2] as a presentation. During these years we have also developed our own website[3] that collects annual incidence and prevalence data separated by modality of renal replacement treatment (RRT) including each autonomous regions (ARs) of Spain and the global data for Spain. We maintain our collaboration with the European ERA-EDTA registry[4] and with the North American USRDS registry,[5] as the reference from Spain. Since 2012 (2011 report),[6] the yearly report at the SEN Congress includes survival data in patients in RRT since 2004, compiling data from the ARs registries that was made available.

In recent years, a new codification of primary renal disease (PRD) has been developed by the ERA-EDTA Registry, with the collaboration of one member of our REER. Subsequently, the REER collaborated in its translation into Spanish published in NEFROLOGÍA.[7] The new coding provides a simpler system to achieve a more precise diagnosis of renal disease, including codes and terms for most renal diseases whether or not may progress end-stage renal failure. It also has the advantage of including the latest advances on renal disease, as well as a direct link to CIE-10 codes and SNOMED identifiers.

The aim of the present REER report is to illustrate the situation of end-stage renal disease (ESRD) in Spain in 2013. Through analysis of the evolution of the epidemiological parameters during recent years, we want to outline the possible evolution of the disease and RRT in the near future.

Methodology

Sources of data

- Annual collection of aggregated and individualised data from the renal registries of the participating ARs. It was not possible to include data from the autonomous region of the Canary Islands in 2013 since in 2013 and 2014 the databases and electronic storage medium were being transferred to the Canary Islands Health Service, which is now analysing the registry.
- Donation and transplant registry of the Spanish Transplant Organisation.
- Reference population of Spain and each autonomous region: the official data on population is provided on 1 January of the year, published by the Spanish Official State Bulletin (BOE).[8–14] Distribution of population by age group, obtained from the Spanish Statistical Office (INE) website.[15]

The incidence and prevalence data were calculated based on the aggregated data, while the survival analysis was performed based on the data on individual patients from the registries provided by the autonomous regions.

Study period

- 2007–2013 for prevalence, incidence and transplants.
- 2004–2012 for the survival analysis.

Definitions

The definitions used were those agreed upon by the Spanish Group of Registries of Renal Diseases (GRER)[16] and, if not available, the definitions of the ERA-EDTA Registry.[17]

- Incidence: Number of patients who started RRT during the specified period; in this report it was in a year period during 2007–2013.
- Prevalence: Total number of alive patients in RRT on 31 December of the corresponding year with residence in each of the ARs.

Incidence and prevalence rates are expressed as patients per million of the population (PMP).

Methods

Rates of incidence and prevalence

- Non adjusted rates: number of incident or prevalent patients divided by the general population in the specific year and multiplied by one million. The rates are presented stratified by PRD, type of replacement therapy, sex and age group.
- Adjusted rates: We use the distribution by age and gender of the European population in 2005 (EU27)[18] for the total in Spain and each AR to adjust the rates using the direct method.

Kidney transplants performed

The number of kidney transplants was recorded from the donation and transplant registry of the Spanish Transplant Organisation[19] and the data was presented stratified by donor type (living, deceased by neurological criteria—brain death—or deceased by circulatory and respiratory criteria—asystole).

Methods for survival analysis

It was based on data on individual patients provided by the ARs with specific consent to be use for analysis. To merge all data, an initial process of data purging and conversion was performed until a uniform format was obtained that allowed the analysis of variables.

Patients incident between 2004 and 2012, over 15 years of age and with a follow-up greater than 3 months were included. Patients with a kidney transplant as a first RRT and patients from other registries were excluded.

For description of the patients included in the survival analysis, mean, median and standard deviation were used for the quantitative variables and percentages and frequencies were used for the categorical variables. The Kaplan–Meier method was used to calculate the unadjusted probability of survival, and the log-rank test was used to compare the survival curves between groups. A Cox proportional hazards model was developed to study factors potentially predictive of survival using

Table 1 – Coverage of the population of Spain by the REER.

	Year						
	2007	2008	2009	2010	2011	2012	2013
Population	45,200,737	46,157,822	46,745,807	47,021,031	47,190,493	47,265,321	47,129,700
Population covered	43,415,981	44,296,880	44,804,102	45,559,052	47,095,618	47,265,321	44,916,825
% Coverage	*96.1*	*96*	*95.8*	*96.9*	*99.8*	*100*	*95.3*

REER: The Spanish Renal Registry.

the following as adjustment variables: age, sex, RRT modality, diabetic nephropathy as PRD and having received at least one transplant.

Death was considered to be an event, censoring the recovery of renal function, transfer to another registry and the loss to follow-up. The analysis was done by intention to treat.

The software programs used were Microsoft Excel and SPSS v.15.0 for Windows.

Results

The total population covered by the registry has varied from year to year, from at least 95.3% to 100% of the total population in Spain for the aggregated incidence and prevalence data (Table 1).

Incidence

In 2013 the total number of patients who started RRT due to ESRD was 5705, for a 95.3% of the total population of Spain. This represents an unadjusted rate of 127 PMP. The lowest rate was in Castilla-La Mancha with 102.3 PMP, and the highest rate was that of Asturias with 158.2 PMP (Table 2). Among incident patients, 3746 (65.7%) were men and 1959 (34.3%) were women, and the rate was 200.9 PMP for men and 102.4 PMP for women (Table 2), so in Spain, for every woman that started RRT, there were 1.9 men who did so. The value varied according to AR; from 1:1 in Melilla up to 2.7 men for each woman in Cantabria and in Castilla y León. By age group, the incidence increased in both men and in women, reaching 414.9 PMP in patients over 75 years of age (Table 3). The age-adjusted incidence rate was 121.5 PMP overall, 158.7 PMP for men and 83.1 for women, with a wide variation among ARs (Table 4 and Fig. 1).

As far as RRT modality, in 2013, 78.9% of patients started in some modality of haemodialysis (HD), 16.9% started in peritoneal dialysis (PD) and 4.2% had an early kidney transplantation. HD rates was 100.2 PMP, PD 21.6 PMP and early kidney transplant 5.3 PMP. Again, a wide variation

Table 2 – Incidence by gender and initial renal replacement treatment modality in 2013.

	Total			Gender				Initial treatment					
				N		PMP		N			PMP		
	Population	N	PMP	Male	Female	Male	Female	HD	PD	ETX	HD	PD	ETX
Andalusia	8,440,300	1043	123.6	655	388	157	90.9	845	160	38	100.1	19	4.5
Aragon	1,347,150	168	124.7	112	56	167.2	82.7	135	30	3	100.2	22.3	2.2
Asturias	1,068,165	169	158.2	121	48	236.6	86.2	125	42	2	117	39.3	1.9
Balearic Islands[a]	1,017,395	144	141.5	91	53	179.3	103.9	123	10	11	120.9	9.8	10.8
Cantabria	591,888	63	106.4	46	17	159.4	56.1	38	14	11	64.2	23.7	18.6
Castile and León	2,519,875	270	107.1	197	73	158.1	57.3	220	44	6	87.3	17.5	2.4
Castile-La Mancha	2,100,998	215	102.3	136	79	128.7	75.7	163	51	1	77.6	24.3	0.5
Catalonia	7,553,650	1095	145	719	376	193	98.2	873	143	79	71.1	18.7	0.7
Autonomous Community of Valencia	5,113,815	683	133.6	434	249	171.2	96.5	537	141	5	170.7	28	15.4
Extremadura	1,104,004	137	121.4	97	40	173.3	70.2	118	18	1	106.9	16.3	0.9
Galicia	2,765,940	393	142.1	264	129	197.7	90.2	291	83	19	105.2	30	6.9
Madrid	6,495,551	780	120.1	505	275	161.7	81.6	630	110	40	97	16.9	6.2
Murcia	1,472,049	160	108.7	107	53	144.6	72.4	125	33	2	84.9	22.4	1.4
Navarra	644,477	69	107.1	48	21	149.6	64.9	53	15	1	82.2	23.3	1.6
Basque Country	2,191,682	262	119.5	183	79	171.2	70.4	178	66	18	81.2	30.1	8.2
La Rioja	322,027	37	114.9	22	15	137.4	92.7	28	8	1	86.9	24.8	3.1
Ceuta[b]	84,180	12	142.6	7	5	162.6	121.6	12	0	0	142.6	0	0
Melilla[b]	83,679	8	95.6	4	4	93	98.4	8	0	0	95.6	0	0
Total in Spain	44,916,825	5708	127.1	3746	1959	200.9	102.4	4502	968	238	100.2	21.6	5.3

PD: peritoneal dialysis (all modalities); HD: haemodialysis (all modalities); N: total number of cases; PMP: patients per million of the population; ETX: early kidney transplant.

[a] The population covered on the Balearic Islands excludes the population of the Island of Menorca, which did not provide any data.

[b] The autonomous cities of Ceuta and Melilla provide care for patients from neighbouring Morocco.

Table 3 – Incidence by age group in 2013 (PMP).

	0–14	15–44	45–64	65–74	>75
Andalusia	6.5	39.6	172.8	399.8	387.4
Aragon	10.7	15.1	136.6	343.7	444
Asturias	0	38.9	193.9	386.8	362.8
Balearic Islands	0	33.2	180.6	524.6	579.7
Cantabria	0	52.3	124.7	388.3	159.1
Castile and León	0	23.9	107.2	315.6	276.6
Castile-La Mancha	0	26.1	140.1	243	378.1
Catalonia	11	34.3	162.7	470.6	535.1
Autonomous Community of Valencia	5.2	35.9	145.5	397.6	499.6
Extremadura	6.3	29.6	163.9	304.9	387.4
Galicia	0	39.3	172.2	365.5	331.2
Madrid	4.9	39.7	151.3	365	440.2
Murcia	3.8	38.7	147.4	399.6	366.8
Navarra	0	31.1	147.8	290.3	323.6
Basque Country	0	46.3	115.3	312.2	370.9
La Rioja	0	23.5	82.1	583.7	327.6
Ceuta	0	80.1	149	395.1	969.2
Melilla	0	79.9	51.8	467.7	517.3
Total in Spain	5	36	153.1	384.6	414.9

PMP: patients per million of the population.

was observed among the different ARs (Table 2 and Fig. 2).

By PRD, 24.6% of incident patients had the diagnosis of diabetes mellitus (DM); classified as PRD of unknown origin (UO) were 20.9%; vascular diseases, including hypertension (vascular and/or hypertensive nephropathy [VHN]), represented a 16.2%; and glomerular disease (glomerulonephritis) were only 12.3% of incident patients (Table 5). DM was the most common PRD (29.2%) in patients who started RRT between 65 and 74 years old, and VHN (24.8%) and UO (27.8%) were the most common PRDs in the group patients with more than 75 years (Table 5). However, the greatest percentage of DM (33.9%) was in the group of 45 to 64 years of age, and the percentage of UO increased with the age group

Table 4 – Age-adjusted incidence (EU27, 2005) 2013 (PMP).

	Male	Female	Total
Ceuta	208.5	149	180.4
Balearic Islands	187.5	110.9	151.1
Catalonia	184.4	95.6	140.5
Melilla	111.1	142.6	128.4
Asturias	186.6	71.2	127.9
Andalusia	138.7	94.4	127
Autonomous Community of Valencia	157.2	93.2	126.6
Madrid	163.1	83.4	122.2
Galicia	158.9	77.6	118.3
Murcia	155.7	79.3	118.2
Extremadura	152.6	67.7	111.8
La Rioja	126	88.9	108.6
Aragon	158.5	73	107.4
Basque Country	146	64	105
Navarra	136.8	63.2	101.2
Cantabria	149.8	51.8	100.9
Castile-La Mancha	120.3	71.2	97
Castile and León	124.4	46.1	86.8
Total in Spain	158.7	83.1	121.5

PMP: patients per million of the population.

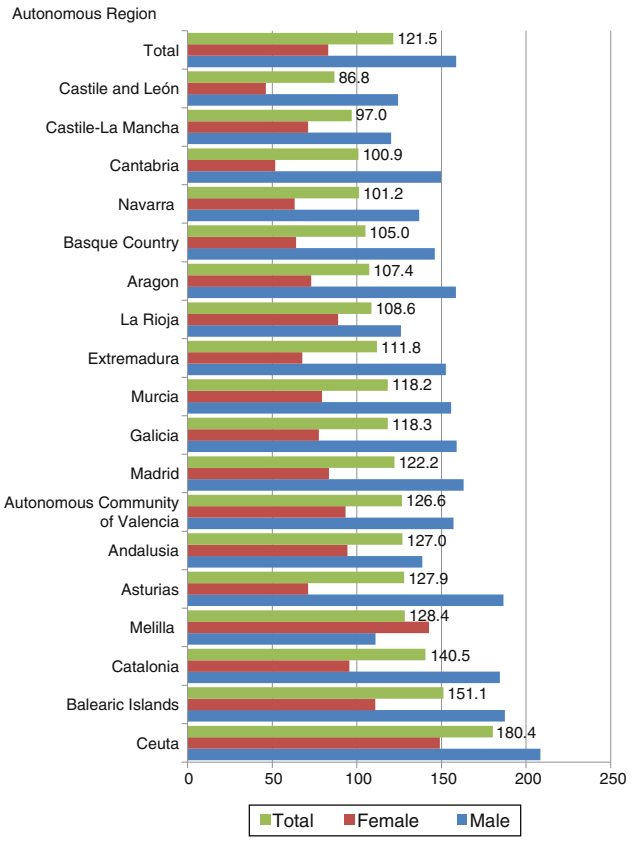

Fig. 1 – Age-adjusted incidence 2013.

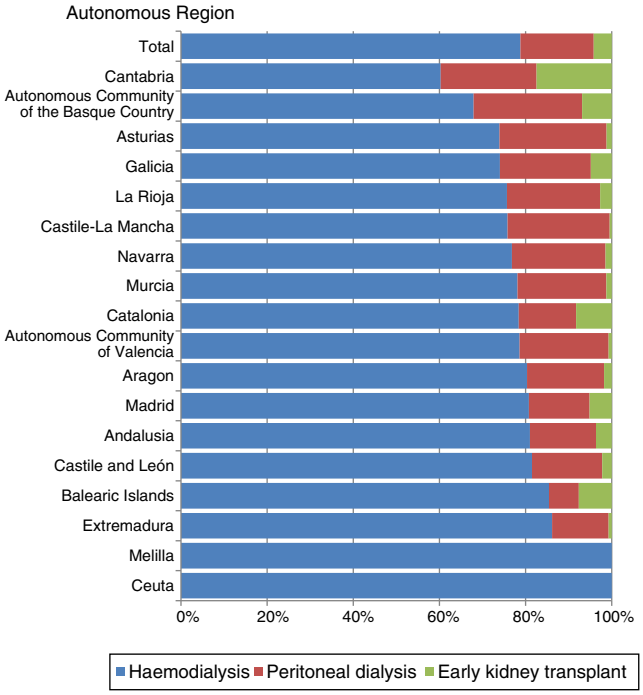

Fig. 2 – Distribution of initial RRT modalities by AR.

reaching a 40.7% in those over 75 years old (Table 6 and Figs. 3 and 4).

The evolution of the overall incidence from 2007 to 2013 shows a sustained a gradual decrease from 127.4 PMP in 2007 (in 2006 it was 130.6 PMP) down to 120.4 PMP in 2012, with a rise of 5.5%, up to 127.1, in 2013, which may be explained by an increase in incidence in the most populared ARs: Andalusia (5.2%), Catalonia (24.6%) and Madrid (14.8%), while in Valencia, the fourth most populated, it decreased (−5.2%) (Table 7 and Fig. 5).

The decrease in incidence occurred at the expense of HD as an initial RRT, while the incidence of PD and early kidney transplant progressively increased reaching 21.5 PMP and 5.5 PMP, respectively in 2013 (Table 8 and Fig. 5).

The PRD has been fairly stable. DM increased from 2007 to 2010, and it became the leading cause of RRT above UOs, then it became stable around 24.5–25% of incident patients (Fig. 6). On the other the incidence in PMP of DM continued to increase every year. It should be taken into consideration that in the last year, the data from the Canary Islands with a incidence of DM as a PRD much greater than the rest of the ARs, was not included in the analysis (Fig. 7).

Prevalence

On December 31st 2013 there were 50,567 patients on RRT corresponding to a 95.3% of the total registry; the unadjusted prevalence rate was 1125.7 PMP with a wide range among ARs. The prevalence was less than 1000 PMP in the Balearic Islands, Cantabria, Madrid, Ceuta and Melilla, and greater than 1200 in Catalonia, Valencia, Galicia and Murcia (Table 9). Among the 50,567 prevalent patients, 31,596 were men (62.5%) and 18,971 were women (37.5%); this represents a rate of 1430 PMP in men and 831.2 PMP in women (Table 9); in Spain for every woman in RRT, there were 1.67 men This ration is varies from 1.25 in

Table 5 – Distribution of PRD in each age group. 2013.

	GN (%)	CPN/CIN (%)	DM (%)	VHN (%)	PKD (%)	HDs (%)	SDs (%)	Other (%)	UO (%)	Total (%)
0–14	14.71	17.7	0	2.9	5.9	29.4	2.9	11.8	14.7	100
15–44	22.4	12.5	16.7	7.1	8.3	5.3	7.1	3.3	17.4	100
45–64	16.5	8.4	26.5	10.7	13	1.7	4.7	3.3	15.3	100
65–74	10.1	8.7	29.2	17.1	4.5	1%	4.8	3.6	21.1	100
>75	6	7.6	22.1	24.8	3	0.5	4.4	3.94	27.9	100
Adults	12.3	8.7	24.7	16.3	7.2	1.6	4.9	3.6	20.9	100
Total	12.3	8.8	24.6	16.2	7.2	1.7	4.9	3.6	20.9	100

DM: diabetes mellitus; HDs: hereditary diseases; PRD: primary renal disease; SDs: systemic diseases; GN: glomerulonephritis; VHN: vascular and/or hypertensive nephropathy; CPN/CIN: chronic pyelonephritis/chronic interstitial nephropathy; PKD: polycystic kidney disease; UO: unknown origin.

Table 6 – Distribution by age group of PRD. 2013.

	GN (%)	CPN/CIN (%)	DM (%)	VHN (%)	PKD (%)	HDs (%)	SDs (%)	Other (%)	UO (%)	*Total (%)*
0–14	0.7	1.2	0%	0.1	0.5	10.2	0.4	1.9	0.4	0.6
15–44	21.1	16.6	7.9	5.1	13.4	35.7	16.9	10.7	9.7	11.6
45–64	42.1	30.1	33.9	20.8	57.1	30.6	30.1	28.6	23	31.4
65–74	21.3	25.8	30.8	27.3	16.3	15.3	25.5	25.7	26.2	25.9
>75	14.9	26.4	27.4	46.7	12.7	8.2	27.2	33	40.7	30.5
Total	100	100	100	100	100	100	100	100	100	100

DM: diabetes mellitus; HDs: hereditary diseases; PRD: primary renal disease; SDs: systemic diseases; GN: glomerulonephritis; VHN: vascular and/or hypertensive nephropathy; CPN/CIN: chronic pyelonephritis/chronic interstitial nephropathy; PKD: polycystic kidney disease; UO: unknown origin.

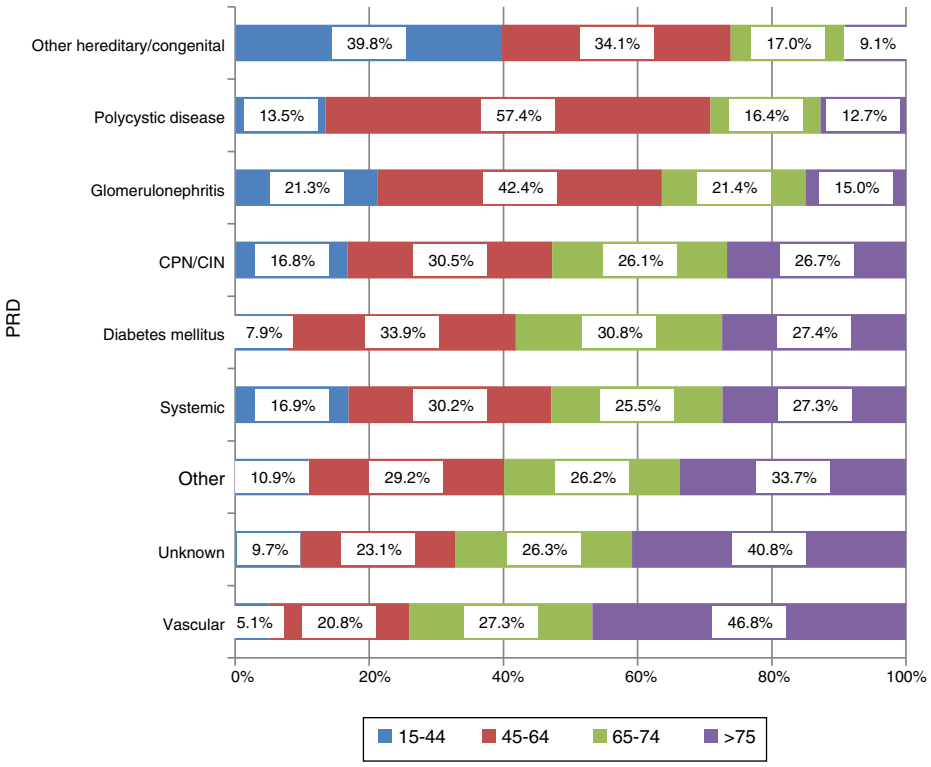

Fig. 3 – Distribution by age group of PRD in the patients who started RRT in 2013.

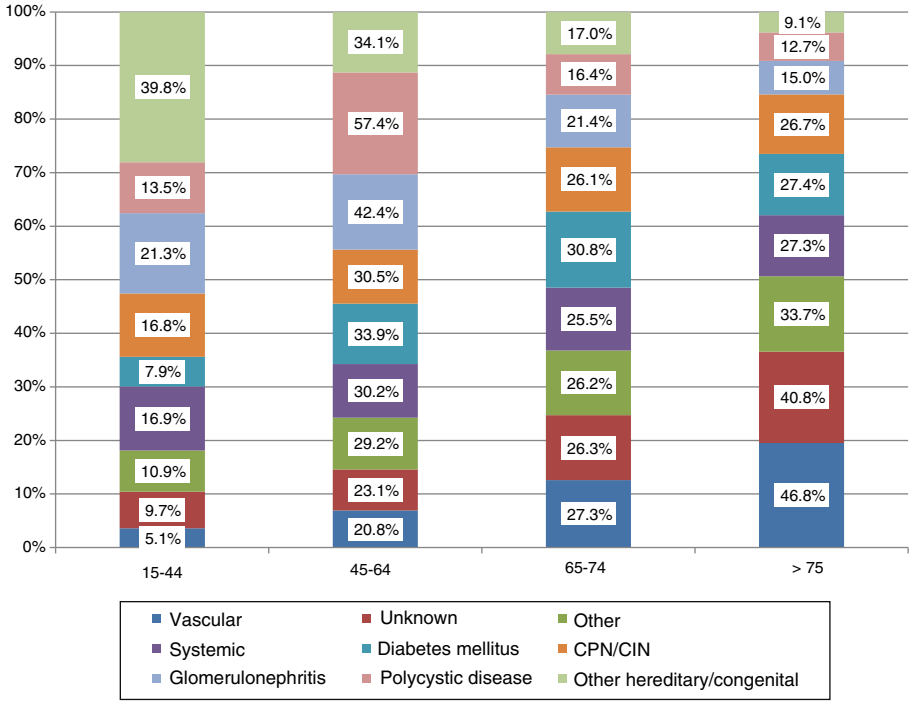

Fig. 4 – PRD by age group 2013.

Table 7 – Overall incidence, unadjusted rate 2007 to 2013 (PMP).

	2007	2008	2009	2010	2011	2012	2013	Variation 2012–2013 (%)
Andalusia	117.9	125.6	118.8	116.6	114	117.5	123.6	5.2
Aragon	131.9	109.3	118.9	121	121.1	131.2	124.7	−4.9
Asturias	132.1	123.1	129.9		141.5	125.3	158.2	26.3
Balearic Islands	111.3	125.4	95	79.6	103.1	144.7	141.5	−2.2
Canary Islands	147.1	150.8	165.4	142.1	166.9	144		
Cantabria	92.5	120.2	125.6	140.1	116.3	114.5	106.4	−7
Castile and León	124.2	124.7	120.1	116	115.7	123.3	107.1	−13.1
Castile-La Mancha	102.7	99.8	95.6	104.4	94.5	98	102.3	4.4
Catalonia	137.3	134.4	142.5	127.1	129.4	116.4	145	24.6
Autonomous Community of Valencia	146	128.6	138.4	137.3	129.8	141	133.6	−5.2
Extremadura	105.5	133	107.9	134.6	105.5	120	124.1	3.4
Galicia	139.2	147.3	124.5	135.1	141.7	132.3	142.1	7.4
Madrid	117.6	125	114.3	107.6	106.2	104.6	120.1	14.8
Murcia					108.8	108.5	108.7	0.2
Navarra	146.9	132.2	122.1	125.6	119.9	103.9	107.1	3
Basque Country	113	107.6	126.1	105.1	107.1	111.7	119.5	7
La Rioja	106.8	132.3	143	124.1	139.3	132.9	114.9	−13.5
Ceuta	326.4	336	266.9	211	194.2	142.8	142.6	−0.2
Melilla	331.2	279.9	122.5	118.4	140.2	210.4	95.6	−54.6
Total in Spain	127.4	128.1	126.5	121.1	120.7	120.4	127	5.5

PMP: patients per million of the population.

Melilla to 2.27 in Cantabria. By age group, the greatest prevalence corresponded to the group from 65 to 74 years of age that reached 3038.1 PMP (Table 10 and Fig. 8).

The adjusted overall prevalence rate in 2013 was 1087.5 PMP; 1360.7 PMP in males and 809.8 PMP in females (Table 11 and Fig. 9).

At the end of the year 2013 on 31 December 2013, 26,043 prevalent patients had a functioning kidney transplant (51.5%), while 21,656 (42.8%) received treatment in HD centers, 78 (0.15%) were on home HD; 1667 (3.3%) received continuous ambulatory peritoneal dialysis and 1120 (2.2%) received cycling PD (Table 9).

Regarding PRD in the prevalent patients, glomerulonephritis was the most common with 20.4% and 231 PMP, followed by UO (20.3% and 229 PMP) and DM (14.9% and 168 PMP), although with marked differences among ARs (Figs. 10 and 11).

On December 31st 2013 among RRT patients on HD and PD in all their varieties, there were 1.8% with positive serology for

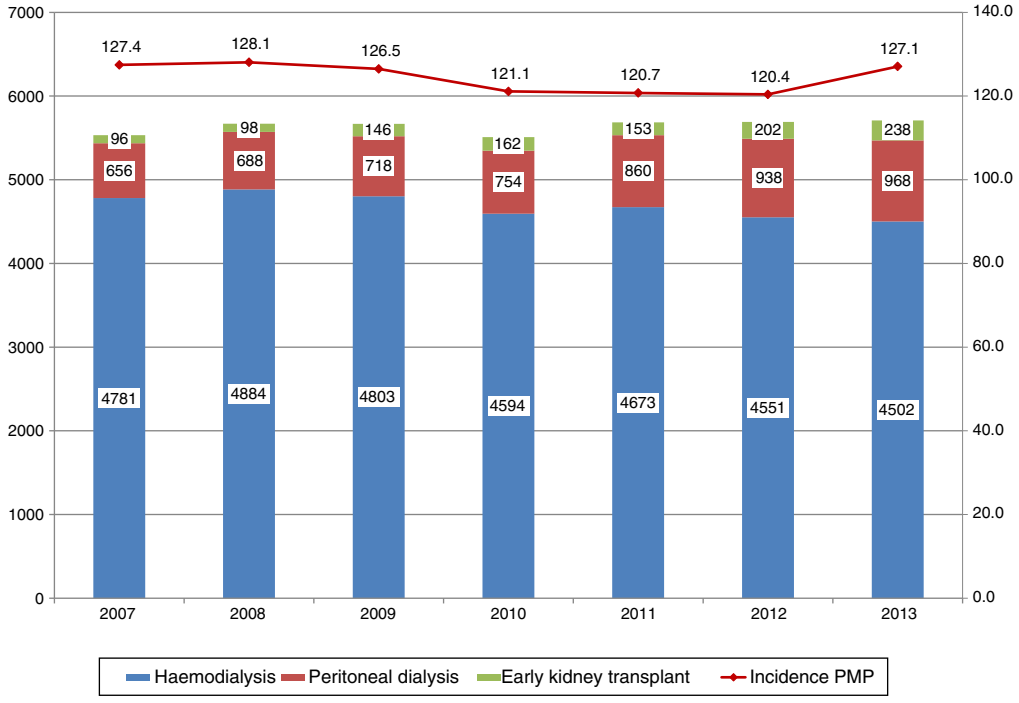

Fig. 5 – Evolution of incidence (PMP) overall and according to initial RRT modality. 2007–2013.

Table 8 – Evolution of the percentage of the different initial RRT modalities 2007–2013.

	2007			2008			2009			2010			2011			2012			2013		
	HD (%)	PD (%)	ETX (%)	HD (%)	PD (%)	ETX (%)	HD (%)	PD (%)	ETX (%)	HD (%)	PD (%)	ETX (%)	HD (%)	PD (%)	ETX (%)	HD (%)	PD (%)	ETX (%)	HD (%)	PD (%)	ETX (%)
Andalusia	89.2	10.1	0.7	88.3	10.1	1.7	86.4	11.4	2.2	89.1	8.3	2.6	86	11.7	2.3	81.9	14.7	3.4	81	15.3	3.6
Aragon	94.7	4.1	1.2	93.8	6.2	0	93.1	6.9	0	87.7	11	1.2	84	13.5	2.5	84.7	12.4	2.8	80.4	17.9	1.8
Asturias	82.4	15.5	2.1	85	12	3	85.1	14.9	0	81.8	13.9	4.4	79.7	17	3.3	75.6	23.7	0.7	74	24.9	1.2
Balearic Islands	88.7	11.3	0	90%	10%	0%	91.2%	8.8%	0%	89.8%	8%	2.3%	81%	18.1%	1%	80.2%	14.8%	4.9%	85.4%	6.9%	7.6%
Canary Islands	88.6	11.1	0.3	88.2	11.8	0	86.5	13.5	0	84.1	15.9	0	87.6	12.4	0	84.3	15.7	0			
Cantabria	66	20.8	13.2	81.4	14.3	4.3	64.9	28.4	6.8	63.9	25.3	10.8	63.8	24.6	11.6	73.5	19.1	7.4	60.3	22.2	17.5
Castile and León	86.6	13.1	0.3	82.8	17.2	0	79.5	20.5	0	79.8	18.5	1.7	78.4	20.3	1.4	80.6	18.5	1	81.5	16.3	2.2
Castile-La Mancha	86.2	12.3	1.5	86.8	12.3	1	89.4	9.5	1	84.5	15.1	0.5	80.5	18.5	1	81.7	18.3	0	75.8	23.7	0.5
Catalonia	86.5	9.3	4.2	84.5	10.6	4.8	81.4	11.5	7	81.4	12.4	6.3	81.9	12.1	6	75.7	16.3	7.9	79.7	13.1	7.2
Autonomous Community of Valencia	91.3	7.9	0.8	91.5	7.3	0.8	90.1	7.9	2	85.2	11.7	3.4	83.9	15.2	0.9	79.4	17.3	3.3	78.6	20.6	0.7
Extremadura	90.4	9.6	0	84.2	15.8	0	84.9	15.1	0	88.6	11.4	0	84.6	15.4	0	87.2	12.8	0	86.1	13.1	0.7
Galicia	78.5	20.2	1.3	81.2	17.8	1	84.5	14.1	1.4	73.3	24.1	2.6	77.3	20.2	2.5	73.1	23.4	3.5	74	21.1	4.8
Madrid	83.6	13.7	2.7	83.7	14.9	1.4	82.9	14.2	2.9	82.9	14.7	2.4	81.9	14.5	3.6	81.6	13.8	4.6	80.8	14.1	5.1
Murcia													85.6	13.1	1.3	86.9	11.3	1.9	78.1	20.6	1.3
Navarra	89.9	10.1	0	84.1	15.9	0	85.7	14.3	0	91.3	11.3	0	76.6	18.2	5.2	76.1	19.4	4.5	76.8	21.7	1.4
Basque Country	74	26	0	81	17.2	1.7	78.1	21.2	0.7	82.1	17.5	0.4	75.2	24.4	0.4	79.2	20	0.8	67.9	25.2	6.9
La Rioja	81.8	18.2	0	85.7	14.3	0	100	0	0	37.5	32.5	0	80	20	0	79.1	20.9	0	75.7	21.6	2.7
Ceuta	100	0	0	100	0	0	100	0	0	100%	0	0	100	0	0	100	0	0	100	0	0
Melilla	100	0	0	100	0	0	100	0	0%	100%	0%	0	54.5	45.5	0	88.2	11.8	0	100	0	0
Total in Spain	86.4	11.9	1.7	86.1	12.1	1.7	84.8	12.7	2.6	83.3	13.7	2.9	82.2	15.1	2.7	80	16.5	3.5	78.9	16.9	4.2

PD: peritoneal dialysis (all modalities); HD: haemodialysis (all modalities); RRT: renal replacement treatment; ETX: early kidney transplant.

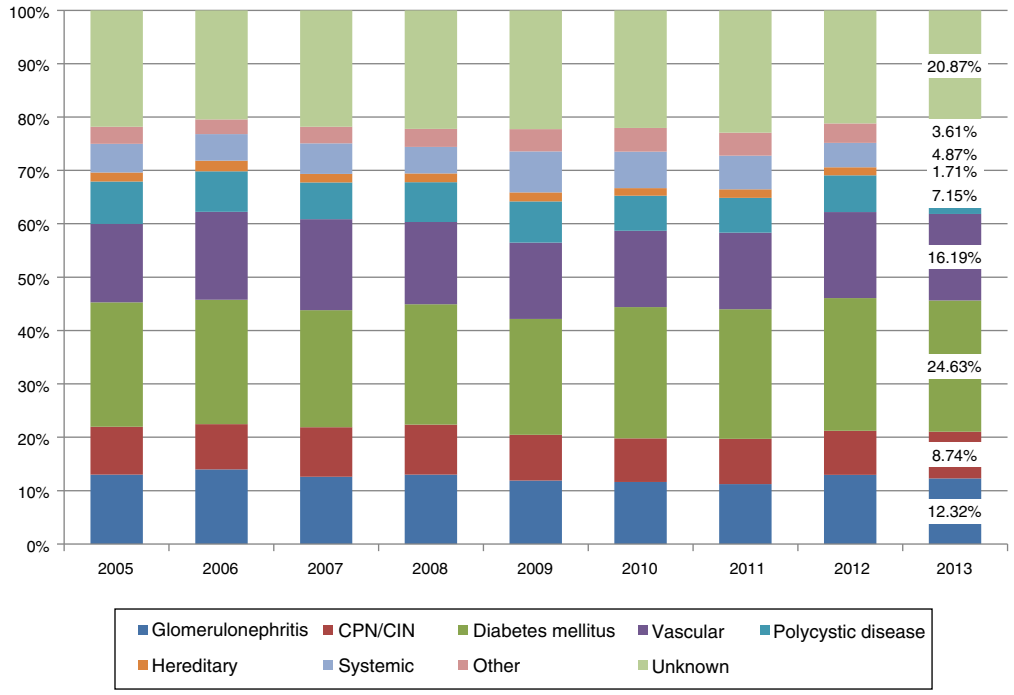

Fig. 6 – Evolution from 2007 to 2013 of the percentage incidence of PRD.

hepatitis B surface antigen (HBV+), 6.9% were positive for the hepatitis C virus (HCV+) and 1.3% had positive serology for the human immunodeficiency virus (HIV+).

The overall prevalence in Spain show a progressive increase with values above 1000 PMP since 2009 reaching 1125.8 PMP in 2013 (Table 12 and Fig. 12). This increase, although it also occurred in patients in HD, was markedly reflected in patients with PD, and above all in transplant patients, who exceeded 50% starting in 2012 (Table 13 and Fig. 12).

Kidney transplant

In Spain, during 2013, there were 2552 kidney transplants performed in Spain, with a rate of 47.12 PMP. Based on donor type, 382 (14.97%) were from a living donor and 200 (7.8%) were from a donor who was deceased by circulatory and respiratory criteria (asystole). In 67 cases the transplant recipient was a child under 16 years of age (Table 14).

From 2007 to 2013, the number of kidney transplants increased by 15.4%, and the rate PMP increased by more than 5 points, from 48.9 PMP to 54.2 PMP. This increase is mostly due to the increase in donations by living donors and in the use of organs from deceased donors in asystole (Table 15 and Fig. 13).

The percentage of transplant patients that returned to dialysis (HD or PD) due to transplant failure remained stable at around 2.5% (Fig. 14).

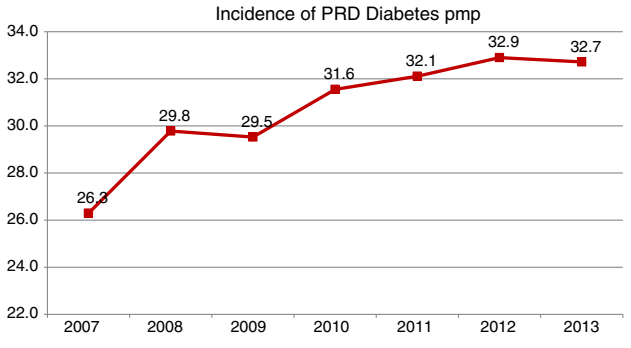

Fig. 7 – Evolution of the incidence of DM as PRD at the start of RRT 2007–2013.

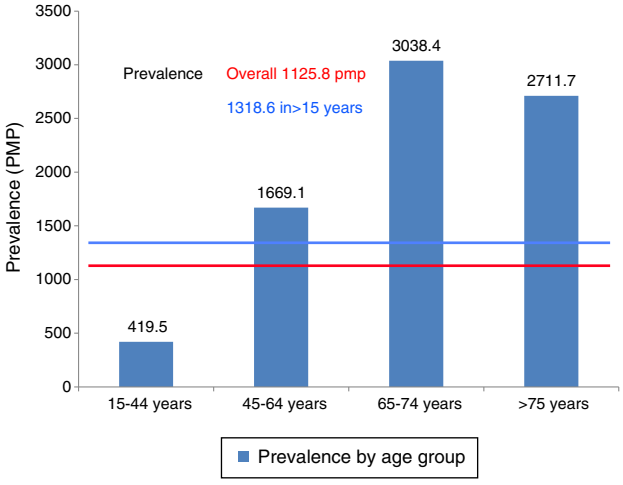

Fig. 8 – Prevalence PMP by age group 2013.

Table 9 – Prevalence by sex and initial renal replacement treatment modality in 2013.

	Total			Gender				Initial treatment									
				N		PMP		N					PMP				
	Population	N	PMP	Male	Female	Male	Female	CHD	HHD	CAPD	CPD	FTX	CHD	HHD	CAPD	CPD	FTX
Andalusia	8,440,300	9193	1089.2	5575	3618	1336.7	847.4	4104	9	0	384	4696	486.2	1.1	0	45.5	556.4
Aragon	1,347,150	1504	1116.4	972	532	1450.8	785.6	549	2	65	5	883	407.5	1.5	48.3	3.7	655.5
Asturias	1,068,165	1209	1131.8	783	426	1531.3	765.1	430	0	51	62	666	402.6	0	47.7	58	623.5
Balearic Islands[a]	1,017,395	945	928.8	598	347	1178.3	680.5	460	0	0	45	440	452.1	0	0	44.2	432.5
Cantabria	591,888	569	961.3	395	174	1368.5	573.8	174	2	29	7	357	294	3.4	49	11.8	603.2
Castile and León	2,519,875	2634	1045.3	1731	903	1388.8	709.1	1051	2	100	67	1414	417.1	0.8	39.7	26.6	561.1
Castile-La Mancha	2,100,998	2150	1023.3	1324	826	1252.6	791.2	811	3	80	44	1212	386	1.4	38.1	20.9	576.9
Catalonia	7,553,650	9533	1262	5975	3558	1603.9	929.4	4017	3	210	193	5110	531.8	0.4	27.8	25.6	676.5
Autonomous Community of Valencia	5,113,815	6295	1231	3889	2406	1534.4	932.8	3325	10	351	46	2563	650.2	2	68.6	9	501.2
Extremadura	1,104,004	1194	1081.5	735	459	1341.1	825.6	580	8	50	23	533	525.4	7.2	45.3	20.8	482.2
Galicia	2,765,940	3361	1215.1	2109	1252	1579.6	875	1473	7	193	88	1600	532.5	2.5	69.8	31.8	578.5
Madrid	6,495,551	6490	999.1	3991	2499	1277.6	741.1	2492	15	267	84	3632	383.6	2.3	41.1	12.9	559.2
Murcia	1,472,049	1767	1200.4	1111	656	1501.7	895.9	896	0	86	7	778	608.7	0	58.4	4.8	528.5
Navarra	644,477	753	1168.4	519	234	1617.2	723.2	271	4	11	20	447	420.5	6.2	17.1	31	693.6
Basque Country	2,191,682	2457	1121.1	1567	890	1466.2	792.6	741	3	164	28	1521	338.1	1.4	74.8	12.8	694
La Rioja	322,027	369	1145.9	233	136	1454.8	840.2	145	2	9	17	196	450.3	6.2	27.9	52.8	608.6
Ceuta[b]	84,180	81	962.2	54	27	1254.1	656.6	81	0	0	0	0	962.2	0	0	0	0
Melilla[b]	83,679	63	752.9	35	28	813.6	688.6	63	0	0	0	0	752.9	0	0	0	0
Total in Spain	44,916,825	50,567	1125.8	31,596	18,971	1430.1	831.2	21,658	75	1666	1120	26,048	482.2	1.7	37.1	24.9	579.9

CPD: cycling peritoneal dialysis; CAPD: continuous ambulatory peritoneal dialysis; CHD: centre haemodialysis; HHD: home haemodialysis; N: total number of cases; PMP: patients per million of the population; FTX: functioning kidney transplant.

[a] The population covered on the Balearic Islands excludes the population of the Island of Menorca, which did not provide any data.

[b] The autonomous cities of Ceuta and Melilla provide care for patients from neighbouring Morocco.

Table 10 – Prevalence by age group in 2013 (PMP).

	0–14	15–44	45–64	65–74	>75
Andalusia	34	455.9	1723.5	3090.4	2654.3
Aragon	37.4	395.4	1644.5	2674.1	2474.9
Asturias	51.7	412	1544.8	2348.7	2140.8
Balearic Islands	0	241.6	1348.7	2968.3	3577.3
Cantabria	0	431.6	1461.3	2543.2	1479.9
Castile and León	0	363.3	1477.3	2374.9	1960.1
Castile-La Mancha	3.1	373.1	1615.6	2984.7	2358.3
Catalonia	58.1	447.9	1846.3	3586	3288.1
Autonomous Community of Valencia	56.1	426.9	1726.7	3250.6	3409.2
Extremadura	6.3	423.3	1737.9	2492	2181.5
Galicia	27.5	471.7	1761.5	2855.2	2004.2
Madrid	36.5	376.3	1524.3	2864.9	2734.7
Murcia	34.6	421.5	1978.4	3606	3762.4
Navarra	0	267.9	1324.4	3084.3	4692.8
Basque Country	56.1	483.6	1524.7	2819.5	2134.9
La Rioja	0	516.2	1525.2	3392.9	2382.6
Ceuta	0	160.2	1837.5	4938.8	3150
Melilla	0	372.9	1139.1	2338.6	4397.3
Total in Spain	36.3	419.4	1669	3038.1	2712

PMP: patients per million of the population.

Mortality

The overall mortality of patients in RRT remained stable around 8% annually throughout the period 2007–2013.

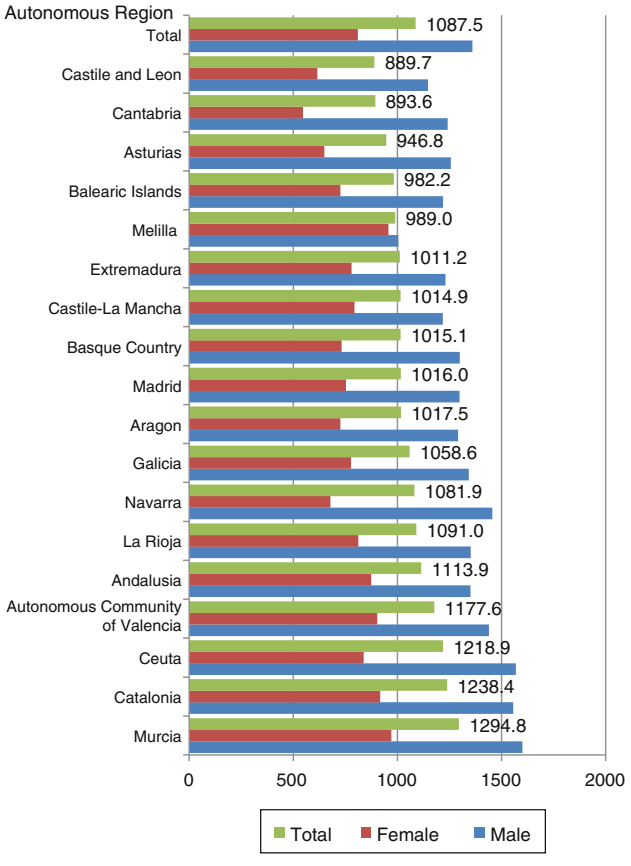

Fig. 9 – Age-adjusted prevalence 2013.

Mortality remain stable in the three modalities of RRT (HD, PD and transplant), although there was a very modest increase in mortality in transplant patients, which continues to be the lowest of the 3 modalities (Table 16).

Survival

Between 2004 and 2012 there were 40,394 incident patients that met the selection criteria. Tables 17 and 18 show the distribution by AR and year.

Table 19 shows the main characteristics of the sample.

Estimated median survival was 6.2 years, with a 95% confidence interval of 6.1 and 6.4.

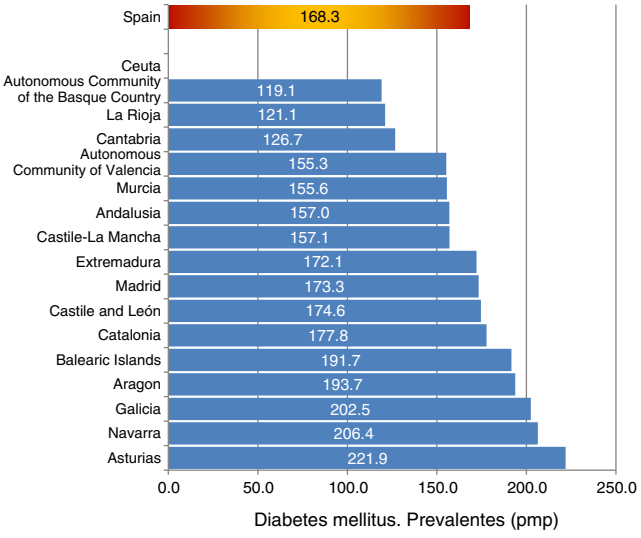

Fig. 10 – DM as PRD in prevalent patients in RRT PMP, according to AR 2013.

Table 11 – Age-adjusted prevalence (EU27, 2005) 2013 (PMP).

	Male	Female	Total
Murcia	1600.8	971	1294.8
Catalonia	1555.6	917	1238.4
Ceuta	1568.5	838.1	1218.9
Autonomous Community of Valencia	1439	902.9	1177.6
Andalusia	1351.1	874	1113.9
La Rioja	1351.8	812	1091
Navarra	1455.8	678.1	1081.9
Galicia	1342.7	777.7	1058.6
Aragon	1291.5	726.5	1017.5
Madrid	1298.1	752.8	1016
Basque Country	1299.2	732.1	1015.1
Castile-La Mancha	1217.5	793.5	1014.9
Extremadura	1231	779.7	1011.2
Melilla	1004.9	956.8	989
Balearic Islands	1218.6	726.3	982.2
Asturias	1256.4	649.5	946.8
Cantabria	1241.6	547	893.6
Castile and León	1146.5	615.1	889.7
Total	*1360.7*	*809.8*	*1087.5*

PMP: patients per million of the population.

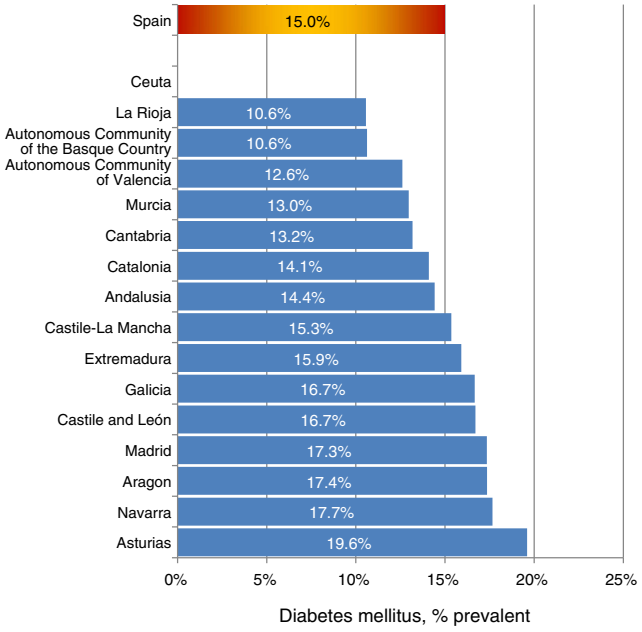

Fig. 11 – Percentage of DM among prevalent patients in RRT, according to AR 2013.

The unadjusted probability of survival was 91%, 81% and 57% after one, 2 and 5 years, respectively, as shown in Table 20.

Table 21 presents the adjusted survival analysis; those variables that had turned out to be significant in the univariate analysis were included as potential predictive factors.

The Cox model shows the following as independent factors of survival: age, diabetes as PRD, transplanted, sex and modality of initial RRT (Table 21), survival being worse for diabetic men over 45 years of age who had started RRT with HD and who had not undergone a transplant.

Fig. 15 shows the survival curves for the incident patients during the period 2004–2012 based on age group.

Discussion and conclusions

Over the course of these 7 years, the REER was able to collect and assemble information about a percentage above 95% of

Table 12 – Overall prevalence, unadjusted rate PMP 2007 to 2013 (PMP).

	2007	2008	2009	2010	2011	2012	2013
Andalusia	952.9	960.3	977.4	1004.1	1028.4	1054.1	1089.2
Aragon	789.7	950.3	998.2	994.7	1028.8	1071.5	1116.4
Asturias	1077.3	973.9	990.5		1030.1	1069.3	1131.8
Balearic Islands	496.9	434.2	588.1	792	886.8	877.2	928.8
Canary Islands	994.6	607.4	1169.2	1143.3	680.4	1162.7	
Cantabria	844.9	834.9	874	883.1	891.9	931.2	961.3
Castile and León	935.8	965.5	994.3	1010.7	1014.7	1038.9	1045.3
Castile-La Mancha	927	911.4	929.2	964.6	997.5	1004.3	1023.3
Catalonia	1099.1	1123.7	1158.5	1188.4	1222.9	1200.1	1262
Autonomous Community of Valencia	1103.8	1098.9	1107.2	1130.9	1147.3	1195.1	1231
Extremadura	893.6	920.1	952.5	999.8	1026.7	1049.5	1081.5
Galicia	1047.8	1061.4	1079	1125.9	1171.6	1178.1	1215.1
Madrid	971.6	1077.2	907.8	926.7	956.6	970.1	999.1
Murcia					1117.6	1153	1200.4
Navarra	485.2	486.8	472.6	500.8	1151	1137.2	1168.4
Basque Country	959.9	1016.6	1024.8	1019.6	1055.6	1093	1121.1
La Rioja	987.2	1124.4	1038.2	1045.2	1136.4	1072.3	1145.9
Ceuta	900.7	969.1	1004.1	1092.1	1031.9	1023.6	962.2
Melilla	1022.5	1007.7	803.2	789.1	828.3	841.6	752.9
Total in Spain	*985.3*	*994.8*	*1015.7*	*1036.7*	*1054.6*	*1091.1*	*1125.8*

PMP: patients per million of the population.

Table 13 – Evolution of the percentage of the different RRT modalities in prevalent patients 2007–2013.

	2007			2008			2009			2010			2011			2012			2013		
	HD (%)	PD (%)	TX (%)	HD (%)	PD (%)	TX (%)	HD (%)	PD (%)	TX (%)	HD (%)	PD (%)	TX (%)	HD (%)	PD (%)	TX (%)	HD (%)	PD (%)	TX (%)	HD (%)	PD (%)	TX (%)
Andalusia	48.6	4.5	46.9	48.9	4.1	47	48.2	4.3	47.5	47.7	4.3	47.9	46.1	4.3	49.6	45.1	4.4	50.5	44.7	4.2	51.1
Aragon	50.5	0.8	61.8	42	1.1	56.9	44.7	1.5	53.8	44.3	2.8	53	40.2	3.7	56.1	39.3	4.3	56.4	36.6	4.7	58.7
Asturias	32.7	4.5	51.2	37.4	5.4	57.2	37.3	5.7	57	37.7	5.8	56.5	37.4	5.9	56.6	35.7	9	55.3	35.6	9.3	55.1
Balearic Islands	91.5	8.5		91	9		92.6	7.4		47.1	3.8	49.1	44.7	4.5	50.7	47.9	4.9	47.3	48.7	4.8	
Canary Islands	54.4	4.4	41.1	91.8	8.2	72.7	50.5	5	44.5	51.6	5.8	42.6	89.7	10.3		49.2	5.3	45.4			
Cantabria	36.4	9.5	54.1	38.3	7	54.7	37.5	7.4	55.1	34.4	7.5	58.1	32.5	7.6	59.9	32.5	6.7	60.8	30.9	6.3	62.7
Castile and León	45.4	5.5	49.1	44.8	5.9	49.3	43.9	6.5	49.6	42.8	6.5	50.7	42	7	51	41.1	6.5	52.5	40	6.3	53.7
Castile-La Mancha	43	5.2	51.8	41.5	3.9	54.7	41.3	3.8	55	41.3	4.5	54.2	41%	5.1	53.9	39.2	5.7	55.1	37.9	5.8	56.4
Catalonia	46.4	3.5	50.1	46.2	3.6	50.2	45.3	3.7	51	44.5	4	51.5	42.7	3.9	53.4	41	4.1	54.9	42.2	4.2	53.6
Autonomous Community of Valencia	56.5	4.3	39.2	56.7	3.8	39.3	56	3.5	40.5	56.2	3.4	40.3	55.2	4.9	39.8	54.6	5.5	40	53	6.3	40.7
Extremadura	49	5.9	45.2	48.6	6	45.3	48.9	6.2	45	50.6	5.9	43.5	49.3	5.8	45	49.2	6.4	44.5	49.3	6.2	44.5
Galicia	43.3	9.2	47.5	45.8	9.4	44.8	46.1	8.6	45.3	45.8	8.8	45.4	45	8.7	46.3	44.6	8.2	47.2	44	8.4	47.6
Madrid	35.5	7.3	57.2	36.4	5.1	58.4	41.4	5.9	52.7	40.4	5.7	53.9	39	5.5	55.5	38.5	5.6	56	38.6	5.4	56
Murcia													55.6	4	40.4	53.5	4.3	42.2	50.7	5.3	44
Navarra	89.5	10.5	111.2	90.4	11.3	117.9	78.2	12.8	0	89	11.3	123.2	37.8	5.1	57.1	37.1	4.8	58.1	36.5	4.1	59.4
Basque Country	30	8.3	61.7	31.5	7.7	60.8	29.6	7.8	62.6	31.5	8.1	60.4	31.5	8.7	59.8	31.2	8.2	60.6	30.3	7.8	61.9
La Rioja	37.7	4.9	57.4	37.3	4.5	51.3	44.9	3.3	51.8	41.2	8	55.8	39.5	6.8	53.7	42.9	8.6	48.4	39.8	7	53.1
Ceuta	100	0		100	0		100	0		100	0		100	0		100	0		100	0	
Melilla	100	0		97.2	0		100	0		100	0		96.9	3.1		97.1	2.9		100	0	
Total in Spain	46.2	5.3	49.3	47.1	5	50.8	46.5	5	48.5	46	5.1	49.8	45.6	5.4	49	43.7	5.4	50.9	43	5.5	51.5

PD: peritoneal dialysis; HD: haemodialysis; RRT: renal replacement treatment; TX: transplant.

Table 14 – Kidney transplants by AR of the transplant centre. 2013.

AR/HOSPITAL	Total in 2013	Chi	Asyst	Living	DK	EB
Andalusia	412	11	32	60	3	
Aragon	85			11		
Asturias	48			5	1	
Balearic Islands	39					
Canary Islands	101		3	12		
Cantabria	61		4	6		
Castile-La Mancha	94		6	0	2	
Castile and León	108		6	3		
Catalonia	540	21	25	165	1	1
Autonomous Community of Valencia	237	7	13	8		4
Extremadura	30					
Galicia	132		2	28		
La Rioja	16		1			
Madrid	406	19	104	40	2	
Murcia	61			4		
Navarra	26			2		
Basque Country	156	9	4	38		
Total in Spain	*2552*	*67*	*200*	*382*	*9*	*5*

Asyst: transplant from a deceased donor in asystole; EB: en bloc double kidney transplant from a child donor; DK: double kidney transplant and older donor; AR: autonomous region; Chi: transplant in children under 15 years of age; Living: transplant from a living donor.

Table 15 – Kidney transplants overall and by AR 2007–2013.

Autonomous region	2007	2008	2009	2010	2011	2012	2013
Andalusia	344	367	381	330	426	457	412
Aragon	63	55	66	65	74	68	85
Asturias	54	40	46	43	53	50	48
Balearic Islands	28	46	45	43	43	52	39
Canary Islands	145	126	103	104	116	91	101
Cantabria	41	27	46	42	48	36	61
Castile-La Mancha	36	51	51	54	59	55	94
Castile and León	83	86	79	93	85	117	108
Catalonia	470	471	524	460	581	559	540
Autonomous Community of Valencia	231	198	209	209	190	232	237
Extremadura	30	35	33	32	44	34	30
Galicia	96	120	127	131	146	138	132
La Rioja					10	5	16
Madrid	395	407	417	420	406	432	406
Murcia	52	45	48	47	54	76	61
Navarra	18	26	35	25	40	32	26
Basque Country	125	129	118	127	123	117	156
Total in Spain	*2211*	*2229*	*2328*	*2225*	*2498*	*2551*	*2552*
Total in Spain (PMP)	*48.92*	*48.29*	*49.80*	*47.32*	*52.93*	*53.97*	*54.15*
Living donor transplants	137	156	235	240	312	361	382
Transplants from a donor in asystole	104	105	145	158	140	201	200
Transplants in Children	72	62	62	58	63	59	67

AR: autonomous region; PMP: patients per million of the population.

Table 16 – Evolution of annual mortality 2007–2013, by treatment modality (%).

	2007	2008	2009	2010	2011	2012	2013
Mortality in HD	15.27	14.52	14.79	14.60	14.12	14.43	15.1
Mortality in PD	8.79	10.54	8.44	8.13	8.07	8.85	8.86
Mortality in TX	1.64	1.50	1.89	1.67	1.85	2.31	2.35
Overall	*8.46*	*8.34*	*8.36*	*8.24*	*7.78*	*7.96*	*8.18*

PD: peritoneal dialysis; HD: haemodialysis; TX: transplant.

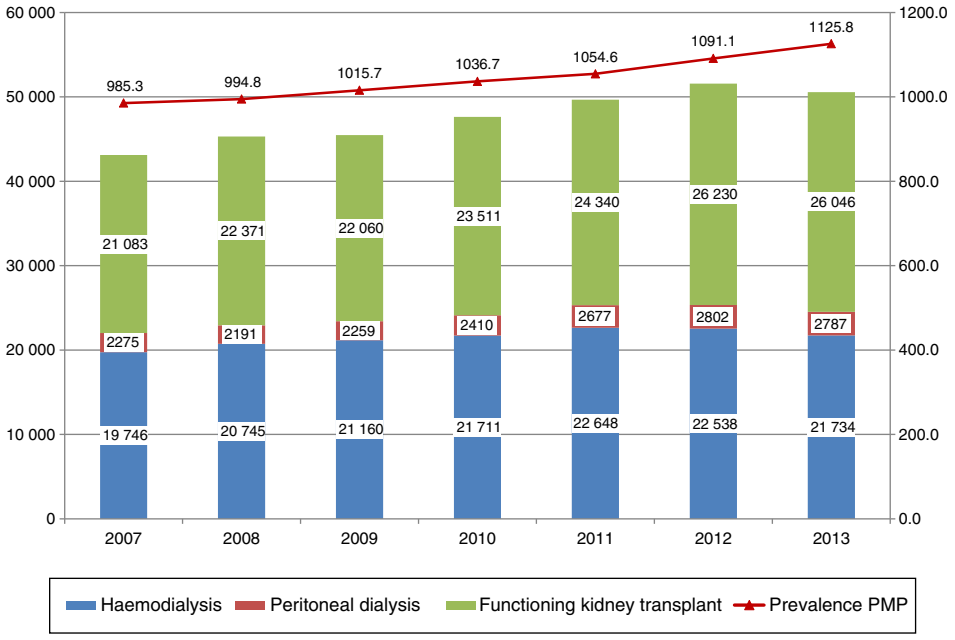

Fig. 12 – Evolution of prevalence (PMP) overall and according to RRT modality 2007–2013.

the population of Spain reaching 100% in 2012, this is despite the occasional difficulties of some of the autonomous region registries. Therefore, the future objective should be to cover 100% of the population every year, with a tendency to group individualised data from an ever greater number of registries, until a total coverage throughout Spain is achieved. Likewise, the quality of data collected is improved, as demonstrated by the temporal coherence of the data.

Annual incidence sustained a gradual decrease, although in 2013 we observed a rise that will have to be confirmed as a result of either a change in the trend or simply a temporary isolated increase. The evolution of incidence in the different varieties of RRT showed the marked decrease in HD as an initial treatment, which went from 86.4% in 2007 to 78.9% in 2013, while the percentage of patients who started RRT with PD increased from 11.9% in 2007 to 16.9% in 2013, and those who had undergone a transplant without previous treatment with HD or PD increased from 1.7% in 2007 to 4.2% in 2013.

The total number of prevalent patients with ESRD in RRT grew from one year to the next, and exceeded 1000 PMP in

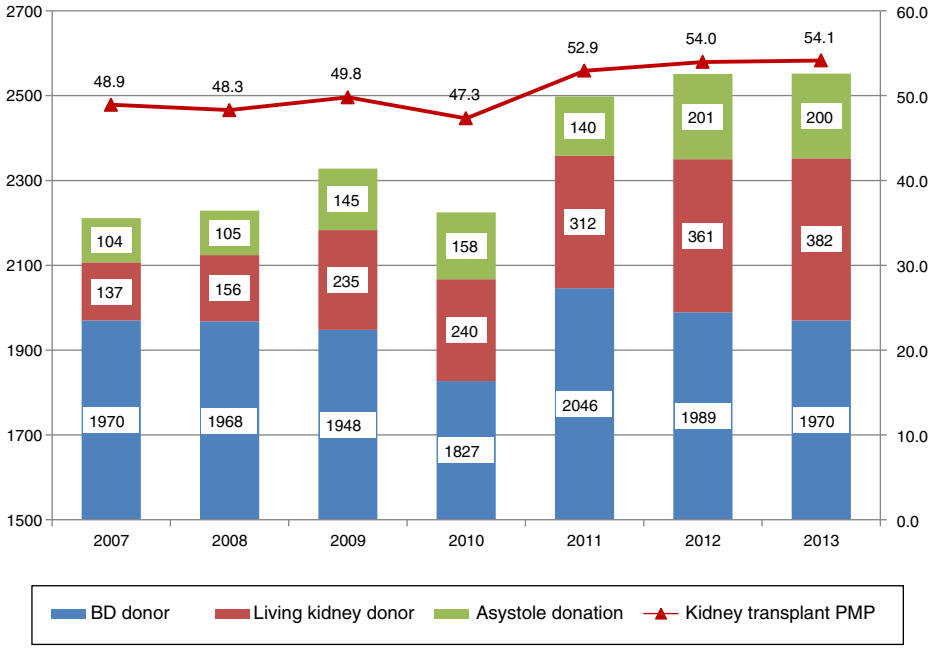

Fig. 13 – Evolution of the number of transplants according to donor type. BD: brain death.

Table 17 – Distribution by AR of the incident patients 2004–2012 included in the survival analysis.

Autonomous Region	2004–2012 N (%)
Andalusia	8175 (20.2)
Aragon	1478 (3.6)
Asturias	1197 (3)
Cantabria	575 (1.4)
Castile-La Mancha	1943 (4.8)
Castilla y León	2697 (6.7)
Catalonia	8539 (21.1)
Autonomous Community of Valencia	6119 (15.1)
Extremadura	1113 (2.8)
Galicia	3121 (7.1)
Madrid	3298 (8.8)
Basque Country	2159 (5.3)
Total	*40,394 (100)*

AR: autonomous region; N: number of cases.

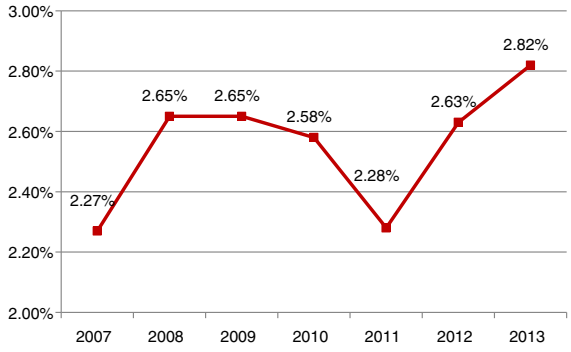

Fig. 14 – Percentage of patients who returned to dialysis following kidney transplant failure.

2010, essentially owing to an increase in functioning kidney transplants, which represented 49.3% in 2007 and 51.5% in 2013.

International comparisons

Comparisons were made with countries with international registries available when the present manuscript was written. The latest USRDS report[20] included data on 2012 and the evolution of the epidemiological data for ESRD from 2006 to 2012.

Incidence

The incidence rate of the countries whose data were collected by the USRDS in 2012 ranged from 25 PMP in Ukraine to 450 in Taiwan and 467 in Jalisco (Mexico). Spain (121 PMP) was in the below the middle of the table, with numbers similar to those of western European countries with similar characteristics (Fig. 16). In these seven years there was a 3.1% decrease, in the same range that Australia (−3.1%), Canada (−4.5%), the Netherlands (−3.3%), Norway (−3.9%) and Israel (−3.9%). Some European countries experienced an even more marked decrease in incidence: Austria (−10.3%), Czech

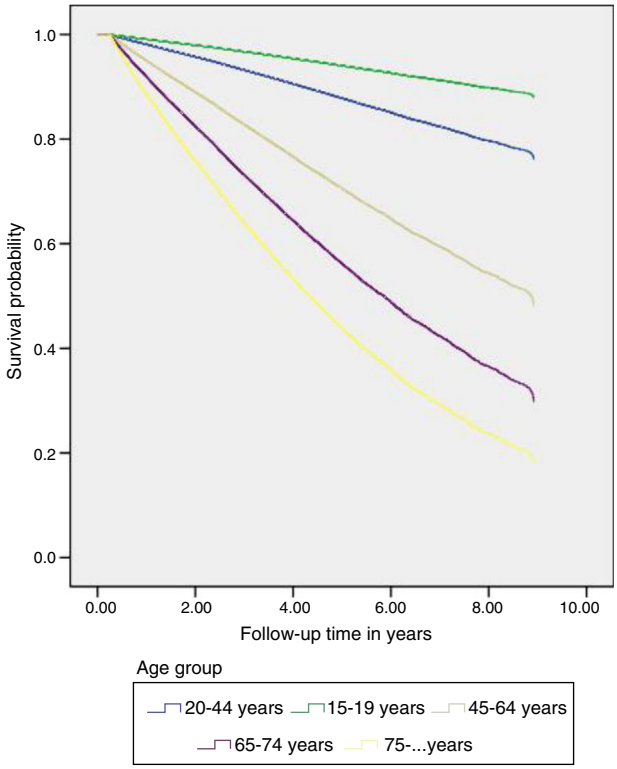

Fig. 15 – Survival of incident patients in the period 2004–2012 for the different age groups.

Table 18 – Distribution by year of the incident patients 2004–2012 included in the survival analysis.

Year of inclusion	N (% compared to total)
2004	4056 (10.0)
2005	4093 (10.1)
2006	4093 (10.1)
2007	4204 (10.4)
2008	4972 (12.3)
2009	4938 (12.2)
2010	4802 (11.9)
2011	4664 (11.5)
2012	4572 (11.3)
Total	*40,394 (100)*

N: number of cases.

Republic (−7.2%), Denmark (−9.7%), Finland (−7.6%) and Sweden (−7.9%) (Fig. 17).

The percentage of DM as PRD varied widely among countries (Fig. 18), with the highest rates in Singapore (66%), Malaysia (61%) and Jalisco (Mexico) (59%), while it represented less than 20% in Flemish Belgium, Russia, Norway, the Netherlands, Romania and Ukraine.

Prevalence

The prevalence at December 31st 2012 was 2902 PMP in Taiwan, 2365 PMP in Japan and 1976 PMP in United States, while in Bahrain, Qatar, Indonesia, Russia, South Africa and Ukraine less than 300 PMP received RRT; Spain, with 1091, was in the upper third of the table In the majority of western

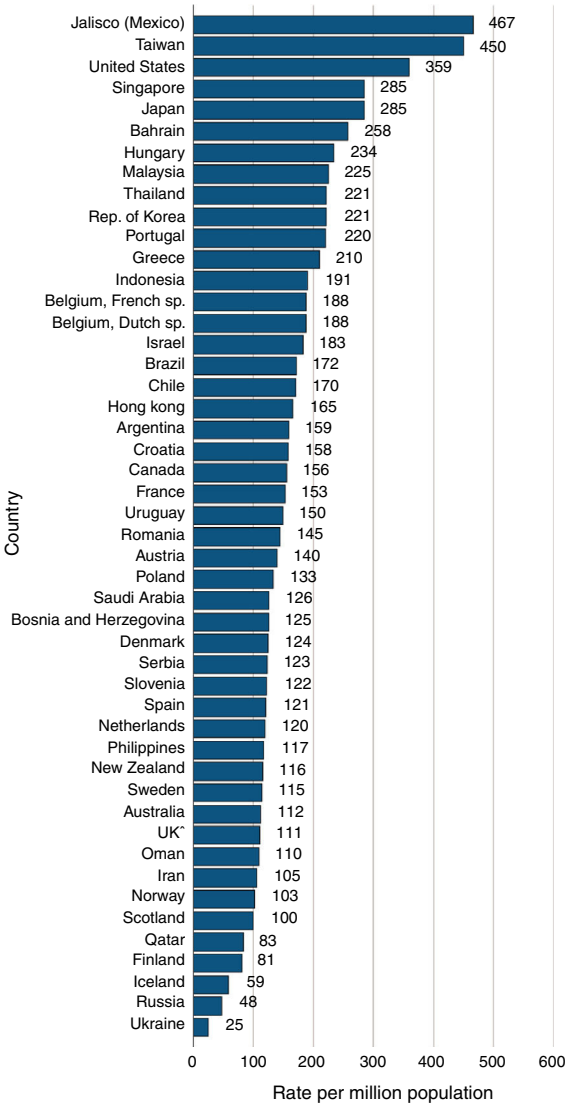

Fig. 16 – Unadjusted incidence rate (PMP) by country in 2012.
***Source*: United States Renal Data System, 2014 Annual Data Report: Epidemiology of Kidney Disease in the United States. 2014. Bethesda, MD: National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases (2014). Special analyses, USRDS ESRD Database. Data presented only for countries from which relevant information was available. All rates are unadjusted. ÛK: England, Wales and Northern Ireland (Scotland data reported separately). Japan and Taiwan are dialysis only. Data for Belgium do not include patients younger than 20. Data for Indonesia represent the West Java region. Data for France include 22 regions. Data for Spain include 18 of 19 regions.**

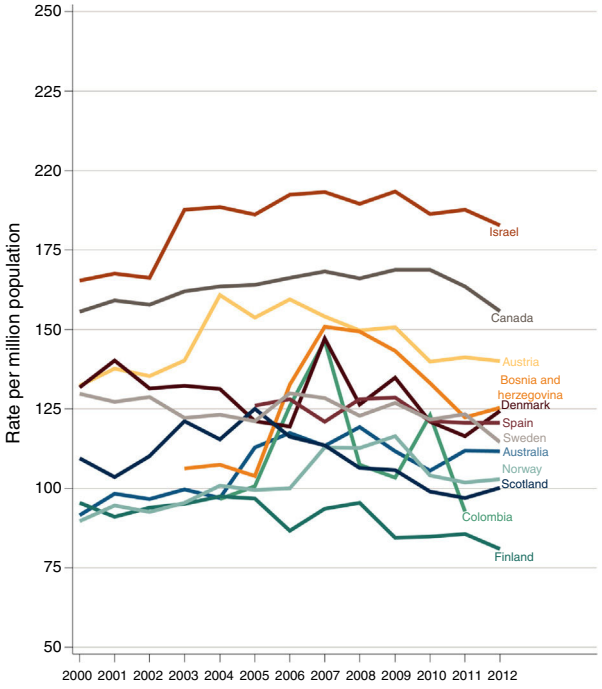

Fig. 17 – Evolution of the ESRD incidence rate (PMP) by country, 2000 to 2012, in countries whose incidence rate decreased by at least 3% from 2006 to 2012.
***Source*: United States Renal Data System, 2014 Annual Data Report: Epidemiology of Kidney Disease in the United States. 2014. Bethesda, MD: National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases (2014). Special analyses, USRDS ESRD Database. All rates are unadjusted. Data are shown for countries with incidence increase or decrease from 2006 to 2012 or 2011.**

European countries the range was between 808 PMP in Finland to 1670 PMP in Portugal (Fig. 19). From 2006 to 2012 Spain unadjusted prevalence increased by 12.9%, similar to the countries around i (Fig. 20), although the prevalence of treatment with dialysis has decreased by 0.4% with the consequent increase in the numbers of transplanted patients and with a functioning graft.

Transplants

In accordance with the 2014 USRDS report,[20] there was major variability in transplant rates among reporting countries, which did not only reflect the variations in incidence and prevalence reported. The highest transplant rate reported, 60 PMP in Norway, was 30 times higher than the lowest transplant rate reported, 2 PMP in Ukraine. The highest rates of kidney transplant for all donor types were those reported by Norway (60 PMP), Jalisco (Mexico) (59 PMP), the Netherlands (57 PMP), the United States (55 PMP), Croatia (54 PMP) and Spain (54 PMP) (Fig. 21): Although, according to the data of the Global Observatory on Donation and Transplantation (GODT),[21] the highest rate of kidney transplant from a deceased donor is 50.5 PMP in Croatia followed by Spain (46.8 PMP), Belgium (44.4 PMP), Estonia (43.9 PMP) and Norway (43.6 PMP) (Fig. 22).

The evolution of the annual rate of transplants from 2006 to 2012 showed an increase in the overall rate in countries of the European Union and all countries of the World Health Organization that reported to the GODT[21] (Table 22). The increase observed in Spain is comparatively much higher, with an 18.3%

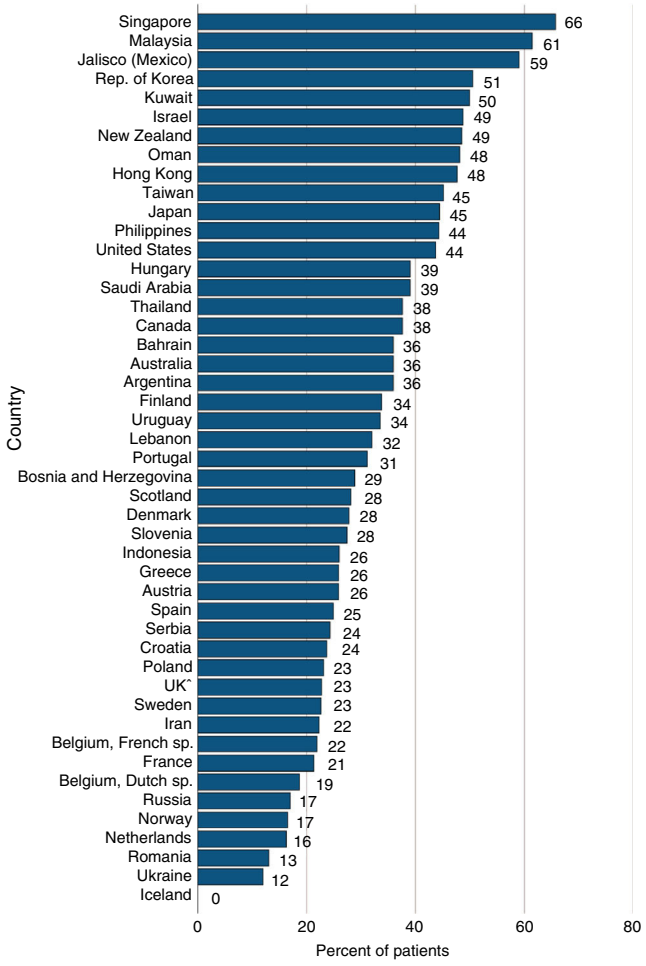

Fig. 18 – Percentage of incident patients with ESRD, in whom diabetes mellitus was the primary renal disease, by country, in 2012.
***Source*: United States Renal Data System, 2014 Annual Data Report: Epidemiology of Kidney Disease in the United States. 2014. Bethesda, MD: National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases (2014). Special analyses, USRDS ESRD Database. Data presented only for countries from which relevant information was available. ÛK: England, Wales and Northern Ireland (Scotland data reported separately). Data for Spain include 18 of 19 regions. Data for France include 22 regions. Data for Indonesia represent the West Java region. Data for Belgium do not include patients younger than 20. There were zero ESRD patients in Iceland with diabetes as the primary ESRD cause in 2012. Abbreviations: ESRD: end-stage renal disease; sp.: speaking.**

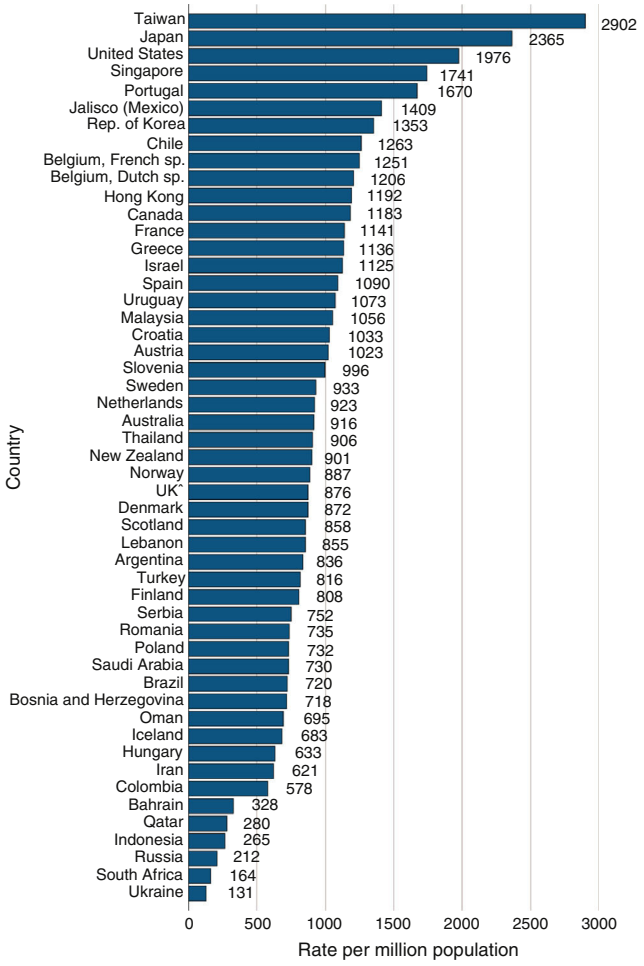

Fig. 19 – Prevalence of ESRD in RRT, PMP by country, in 2012.
***Source*: United States Renal Data System, 2014 Annual Data Report: Epidemiology of Kidney Disease in the United States. 2014. Bethesda, MD: National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases (2014). Special analyses, USRDS ESRD Database. Data presented only for countries from which relevant information was available. All rates are unadjusted and reflect prevalence at the end of 2012; rates for Colombia and Lebanon reflect prevalence at the end of June 2012. ÛK: England, Wales and Northern Ireland (Scotland data reported separately). Japan and Taiwan include dialysis patients only. Data for Belgium do not include patients younger than 20. Data for Indonesia represent the West Java region. Data for Spain include 18 of 19 regions. Data for France include 22 regions. Data for Turkey in 2012 was collected with the collaboration of the Ministry of Health, which collects patient-based data; however, in previous years center-based data were reported. Abbreviations: ESRD: end-stage renal disease; sp.: speaking.**

Table 19 – Characteristics of the patients included in the survival analysis 2004–2012.

Characteristics	N	%
Sex		
Male	25,858	64
Female	14,536	36
Age groups		
Under 20	166	0.4
20 to <45	5086	12.6
45 to <65	12,826	31.8
65 to <75	10,923	27
75+	11,393	28.2
Age at the start of treatment	Mean: 64.06 (SD = 15.16) Median: 67.28 (IQR: 54.54–75.94)	
Diabetes		
Yes	8533	21.1
Initial RRT		
Haemodialysis	34,869	86.3
Peritoneal dialysis	5515	13.7
Transplant		
Yes	7772	19.2
Death	13,867	34.3
Censure events (loss to follow-up, recovery of renal function or transfer to another registry)	1212	3
Total	40,394	100

SD: standard deviation; N: number of cases; IQR: interquartile range; RRT: renal replacement treatment.

Table 21 – Cox model.

Variable	HR	95% CI	*p*
Age group			
15–19 years	0.47	0.20–1.14	0.96
20–44 years	1	–	0.000
45–64 years	2.7	2.41–2.99	0.000
65–74 years	4.44	3.99–4.93	0.000
≥75 years	6.35	5.71–7.06	0.000
Diabetes as PRD	1.28	1.23–1.33	0.000
Female sex	0.86	0.83–0.90	0.000
PD as initial RRT	0.91	0.85–0.96	0.001
Transplant	0.16	0.15–0.18	0.000

PD: peritoneal dialysis; PRD: primary renal disease; HR: hazard ratio; 95% CI: 95% confidence interval; RRT: renal replacement treatment.

increase in total kidney transplants, with the extraordinary contribution of transplants from a living donor (253.9%) and from deceased donors in asystole (107.2%).

Survival

Comparisons with international data[20,22] with respect to the survival of patients in RRT were limited by differences in the methodology used for analysis and data processing as well as differences in the analysis of cohorts followed through different periods of time.

Table 20 – Unadjusted survival.

Years	N of events	N who entered in the interval	N at risk	Survival (%)	95% CI
1	3422	40,394	37,936	91	90.8–91.2
2	3319	32,057	29,930	81	80.6–81.4
3	1250	12,980	11,500	57	56.6–57.4

N: number of cases; 95% CI: 95% confidence interval.

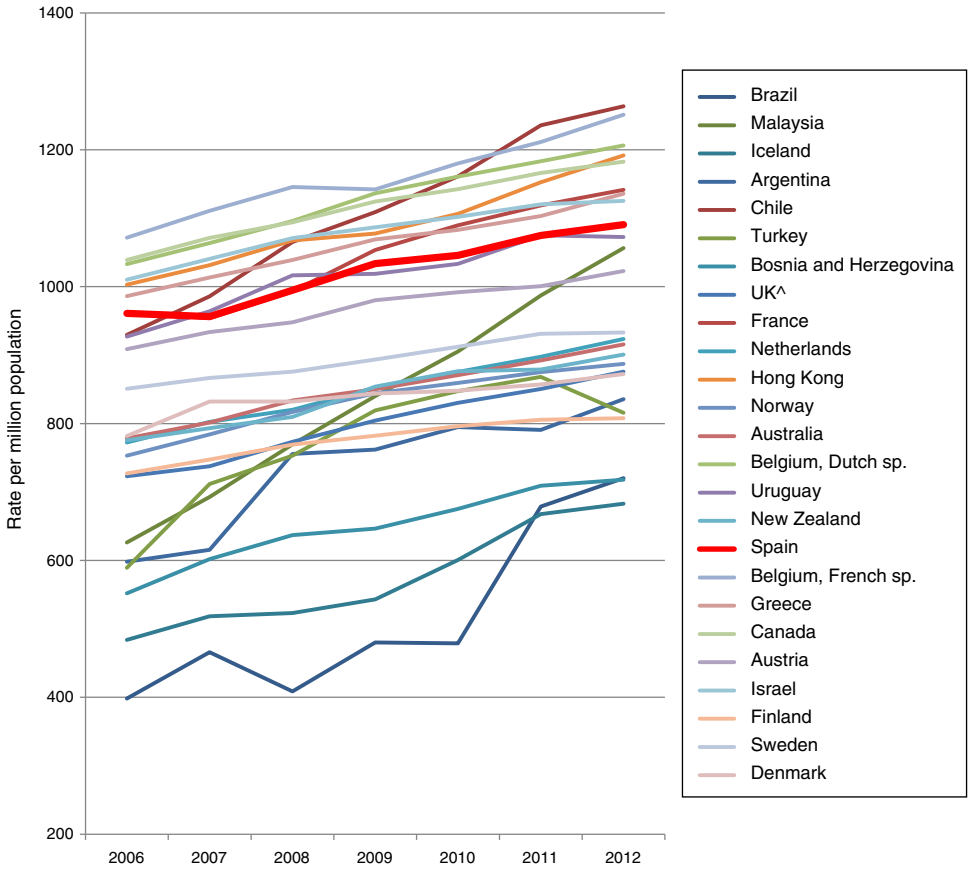

Fig. 20 – Trend in the prevalence of ESRD in RRT, PMP by country, in 2012.
***Source*: United States Renal Data System, 2014 Annual Data Report: Epidemiology of Kidney Disease in the United States. 2014. Bethesda, MD: National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases (2014).**

Table 22 – Evolution of kidney transplants 2006–2012.

	EU27						UE28	% increase 2006–2012
	2006	2007	2008	2009	2010	2011	2012	
Population	488.42	492.3	493	500	501.6	504.2	507.5	3.9
Total kidney TXs	16,819	17,306	17,198	17,886	18,246	18,712	19,085	13.5
TX from living donor	2617	2926	3089	3354	3616	3857	3970	51.7
TX from deceased donor	14,204	14,380	14,109	14,532	14,630	14,855	15,115	6.4
TX from donor in asystole	598	707	837	1007	1037	1178	1400	134.1
Total TXs PMP	34.4	35.2	34.9	35.8	36.4	37.1	37.6	9.2
Living donor TX PMP	5.4	5.9	6.3	6.7	7.2	7.6	7.8	46
TX from deceased donor PMP	29.1	29.2	28.6	29.1	29.2	29.5	29.8	2.4
TX from donor in asystole PMP	1.2	1.4	1.7	2	2.1	2.3	2.8	125.3
	Spain							
Population	44.7	45.2	46.2	46.75	47	47.2	46.8	4.7
Total kidney TXs	2157	2211	2229	2328	2225	2498	2551	18.3
TX from living donor	102	137	156	235	240	312	361	253.9
TX from deceased donor	2055	2074	2073	2093	1985	2186	2190	6.6
TX from donor in asystole	97	104	105	148	158	140	201	107.2
Total TXs PMP	48.3	48.9	48.2	49.8	47.3	52.9	54.5	13
Living donor TX PMP	2.3	3	3.4	5	5.1	6.6	7.7	238
TX from deceased donor PMP	46	45.9	44.9	44.8	42.2	46.3	46.8	1.8
TX from donor in asystole PMP	2.2	2.3	2.3	3.2	3.4	3	4.3	97.9
	103 Member countries of the World Health Organization that provided data to the GODT							
Total kidney TXs	65,700	65,511	68,250	69,214	71,418	73,179	76,118	15.9

GODT: Global Observatory on Donation and Transplantation; PMP: patients per million of the population; TX: transplant.

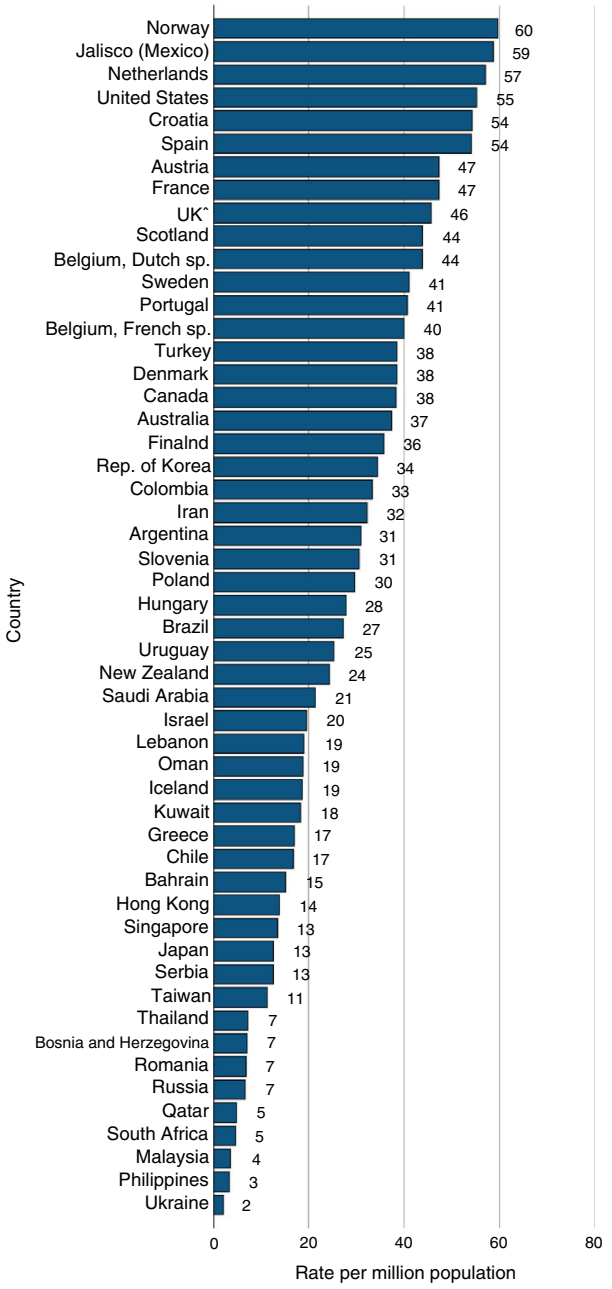

Fig. 21 – Rate of kidney transplant, PMP, by country, in 2012.

***Source*: United States Renal Data System, 2014 Annual Data Report: Epidemiology of Kidney Disease in the United States. 2014. Bethesda, MD: National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases (2014). Special analyses, USRDS ESRD Database. Data presented only for countries from which relevant information was available. All rates are unadjusted. ÛK: England, Wales and Northern Ireland (Scotland data reported separately). Data for Belgium do not include patients younger than 20. Data for France include 22 regions. Data for Spain include all regions. There is underreporting of prevalent transplant patients in Turkey. Abbreviations: sp.: speaking.**

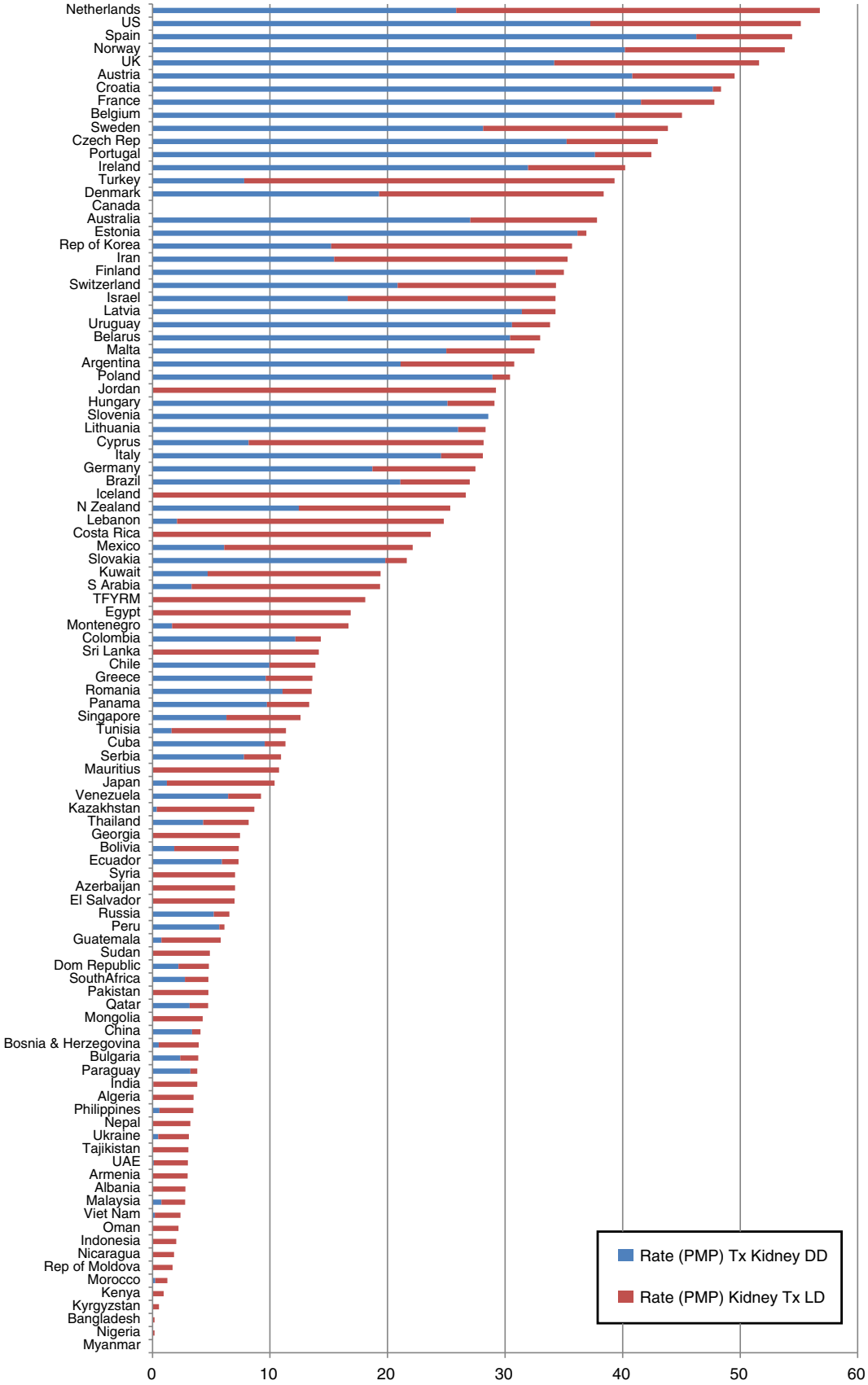

Fig. 22 – Rate of kidney transplant, PMP, by country, in 2013, according to donor type. DD: deceased donor; LD: living donor. *Source*: Global Observatory on Donation and Transplantation (GODT). Organ Donation and Transplantation Activities 2012.

Conflicts of interest

The author has no conflicts of interest to declare.

Annex 1. REER members

Spanish Transplant Organisation: Eduardo Martín-Escobar, Beatriz Mahillo Durán; Spanish Society of Nephrology (SEN): J. Emilio Sánchez, Ramón Saracho Rotaeche; Andalusia Renal Registry (SICATA): Pablo Castro de la Nuez, Miguel Ángel Gentil Govantes; Aragon Renal Registry: José M. Abad Diez, José Ignacio Sánchez Miret; Asturias Renal Registry: Ramón Alonso de la Torre, José Ramón Quirós García; Balearic Islands Renal Registry: Catalina Garrigó; Valencia Renal Registry (REMRENAL): Manuel Ferrer-Alamar, Oscar Zurriaga Llorens; Cantabria Renal Registry: Manuel Arias, Óscar García Ruiz; Castilla-La Mancha Renal Registry: Gonzalo Gutierrez Ávila, Inmaculada Moreno Alía; Castilla y León Renal Registry: Raquel Gonzalez Fernández, José María Monfá Bosch; Catalonia Renal Registry: Jordi Comas Farnes, Emma Arcos Fuster; Extremadura Renal Registry: María A. García Bazaga, Julian Mauro Ramos Aceitero; Galicia Renal Registry: Encarnación Bouzas Caamaño, Teresa García Falcón, Jacinto Sánchez Ibañez; La Rioja Renal Registry: Enma Huarte-Loza, Marta Artamendi Larrañaga; Madrid Renal Registry (REMER): Manuel Aparicio Madre, José A. Herrero; Murcia Renal Registry: Carmen Santiuste de Pablos; Navarra Renal Registry: Jesús Arteaga Coloma; Basque Country Renal Registry: Angela Magaz Lago, Iñigo Moina Eguren.

REFERENCES

1. Registro Español de Enfermos Renales. Informe 2006 de diálisis y trasplante renal en España. Nefrología. 2009;29:525–33.
2. Sociedad Española de Nefrología. Sociedad Española de Nefrologia. Available at: http://www.senefro.org/ [accessed 01.02.15].
3. Registro Español de Enfermos Renales. Registro Español de Enfermos Renales. [En línea]. Available at: http://www.registrorenal.es [accessed 01.02.15].
4. European Renal Association-European Dialysis and Transplant Association. ERA-EDTA Registry. Available at: http://www.era-edta-reg.org/ [accessed 01.02.15].
5. United States Renal Data System (USRDS). Available at: http://www.usrds.org/ [accessed 01.02.15].
6. Registro Español de Enfermos Renales. Registros de Diálisis y Trasplante. Sociedad Española de Nefrología (SEN). Available at: http://www.senefro.org/modules/webstructure/files/reercongsen2012.pdf [accessed 28.12.14].
7. Zurriaga O, López-Briones C, Martín Escobar E, Saracho-Rotaeche R, Moina Eguren I, Pallardó Mateu L, et al. Adaptación en español del nuevo sistema de codificación de enfermedad renal primaria de la European Renal Association-European Dialysis and Transplant Association (ERA-EDTA). Nefrología. 2015;35:353–7.
8. Real Decreto 1683/2007, de 14 de diciembre, por el que se declaran oficiales las cifras de población resultantes de la revisión del padrón municipal referidas al 1 de enero de 2007. Boletín Oficial del Estado. 28 de diciembre de 2007, pp. 53566–8.
9. Real Decreto 2124/2008, de 26 de diciembre, por el que se declaran oficiales las cifras de población resultantes de la revisión del Padrón municipal referidas al 1 de enero de 2008. Boletín Oficial del Estado. 27 de diciembre de 2008, pp. 52072–4.
10. Real Decreto 1918/2009, de 11 de diciembre, por el que se declaran oficiales las cifras de población resultantes de la revisión del padrón municipal referidas al 1 de enero de 2009. Boletín Oficial del Estado. 24 de diciembre de 2009, pp. 109453–8.
11. Real Decreto 1612/2010, de 7 de diciembre, por el que se declaran oficiales las cifras de población resultantes de la revisión del padrón municipal referidas al 1 de enero de 2010. Boletín Oficial del Estado. 23 de diciembre de 2010, pp. 106195–9.
12. Real Decreto 1782/2011, de 16 de diciembre, por el que se declaran oficiales las cifras de población resultantes de la revisión del padrón municipal referidas al 1 de enero de 2011. Boletín Oficial del Estado. 17 de diciembre de 2011, pp. 138416–21.
13. Real Decreto 1697/2012, de 21 de diciembre, por el que se declaran oficiales las cifras de población resultantes de la revisión del padrón municipal referidas al 1 de enero de 2012. Boletín Oficial del Estado. 29 de diciembre de 2012, pp. 89311–4.
14. Real Decreto 1016/2013, de 20 de diciembre, por el que se declaran oficiales las cifras de población resultantes de la revisión del padrón municipal referidas al 1 de enero de 2013. Boletín Oficial del Estado. 28 de diciembre de 2013, pp. 105982–5.
15. Instituto Nacional de Estadística. Cifras de población. Series desde 2002. Available at: http://www.ine.es/ [accessed 28.12.14].
16. Grupo de Registros de Enfermos Renales (GRER). Sociedad Española de Nefrología. Registros de Enfermos Renales (GRER). Enero de 2006. Available at: http://www.senefro.org/modules/webstructure/files/informe_170206.pdf [accessed 15.12.14].
17. ERA-EDTA Registry. Definitions and coding systems. Department of Medical Informatics ERA-EDTA Registry. Academic Medical Center. ERA-EDTA Registry Annual Report 2012. Amsterdam, The Netherlands: s.n.; 2014. p. 122–31.
18. Eurostat. Population (demography, migration and projections). Average population by sex and five-year age groups. Available at: http://epp.eurostat.ec.europa.eu/portal/page/portal/population/data/database [accessed 15.08.13].
19. Organización Nacional de Trasplantes. Datos globales de donación y trasplante. Available at: http://www.ont.es/infesp/Paginas/DatosdeDonacionyTrasplante.aspx [accessed 15.12.14].
20. United States Renal Data System, 2014 Annual Data Report: Epidemiology of kidney disease in the United States. 2014. Bethesda, MD: National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases; 2014. p. 10.
21. World Health Organization (WHO) in collaboration with Organización Nacional de Trasplantes (ONT). Global Observatory on Donation & Transplantation (GODT). Available at: http://http://www.transplant-observatory.org/ [accessed 30.03.15].
22. ERA-EDTA Registry: ERA-EDTA Registry annual report 2013. Amsterdam, The Netherlands: Academic Medical Center, Department of Medical Informatics; 2015.