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Epidemiological study on chronic renal failure elderly patients on hemodialysis

A. L. M. de Francisco*, F. Sanjuán, A. Foraster, S. Fabado, D. Carretero, C. Santamaría, J. Aguilera, M. I. Alcalá and P. Aljama

*Reina Sofía University Hospital. Córdoba. *Department of Nephrology. Valdecilla University Hospital. Santander.*

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SUMMARY

Hemodialysis shows an increased prevalence in elderly patients, a population which often presents poor nutrition, high prevalence of cardiovascular, neurological and osteoarticular diseases and psycho-social problems. The objective of this epidemiological, cross-sectional and multicenter study, in patients older than 65 years (n 625) and > 75 years (n 558) from 29 Spanish medical institutions was to perform an epidemiological analysis It included demographic information, as well as data regarding chronic renal failure, functional and psychological abilities (Katz Index, Lawton and Karnofsky Scales), dialysis logistics and clinical parameters. The study analyzed data from 1,183 patients (678 female), mean age 75,4 ± 5,5 years; mean duration of dialysis 4,3 ± 5,1 years (57,7% were referred by the GP: general practitioner). The most frequent etiologies were diabetic nephropathy (21,2%) and vascular renal disease (20,9%). The main comorbilites were high blood pressure (75,6%), Diabetes Mellitus (32,9%) and vascular (29,0%) and osteoarticular (27,3%) diseases. The great majority of patients lived at their family home (85,0%), travelled to their dialysis units alone (80,8%) and by ambulance (56,7%), and it took them less than an hour to arrive (87,5%). Over 75% of patients were fully functional (79,4% under 75 years and 71,6% over 75); meanwhile 10,5% were partially impaired and 13,8% severely impaired. Karnofsky performance scale scored less than 70 in 59,4% of the patients. Analytical parameters rated Hb ≥ 11 g/dL for 81,7% of patients; ferritin ≥ 100 ng/dL for 98,5%; PTH 150-300 pg/mL for 31,9%; albumin > 3,5 g/dL for 75,6%; and serum phosphor < 5,5 mg/dL for 70,6%. For the dialysis Kt/V the mean value was 1,4 ± 0,3 with a mean duration of dialysis session of 11,7 ± 4,0 hours/week. High permeability membranes were used in 52,3% of patients and internal arteriovenous fistula in 74,0%. Around 75% of elderly patients on hemodialysis fulfill age-suitable daily living activities and display adequate dialysis quality parameters.

Key words: *Hemodialysis. Elderly. Quality of life vascular access. Adequate dialysis.*

RESUMEN

Los ancianos, una población cada vez más prevalente en hemodiálisis, suelen presentar mal estado nutricional, alta prevalencia de enfermedades cardiovasculares, neurológicas y osteoarticulares, y problemas psicosociales. Este trabajo analiza descriptivamente la epidemiología de esta población, mediante un estudio multicéntrico epidemiológico transversal de 1.183 pacientes en 29 centros españoles con pacientes mayores de 65 (n 625) y mayores de 75 años (n 558) en hemodiálisis. En él se examinan parámetros demográficos, relativos a la insuficiencia renal crónica (IRC), valoración cognitiva-funcional (índice de Katz, Karnofsky y escala Lawton), aspectos logísticos y parámetros analíticos. 678 fueron mujeres La media de edad fue de 75,4 ± 5,5, y 4,3 ± 5,1 años desde el diagnóstico de IRC al inicio de la hemodiálisis, y el 57,7% fue remitido por el médico de familia. Las etiologías más frecuentes fueron: nefropatía diabética (21,2%) y enfermedad vascular renal (20,9%). En las comorbilidades se halló hipertensión arterial (75,6%), Diabetes Mellitus (32,9%), enfermedad vascular (29,0%) y osteoarticular (27,3%). La gran mayoría de los pacientes vivían en un domicilio familiar fijo (85,0%), acudían solos (80,8%) y en ambulancia (56,7%) a diálisis, y tardaban menos de 1 h en llegar a sus centros (87,5%). Más del 75,0% de los pacientes se encontraban en pleno funcionamiento (el 79,4% de los menores de 75 años y años el 71,6% de los mayores de 75), un 13,8% presentaban un deterioro funcional severo, y el 10,5% restante un deterioro moderado. En el análisis de la valoración cognitiva-funcional, el 59,4% de los pacientes presentaron un Karnofsky menor de 70. En la analítica, el porcentaje de pacientes con Hb ≥ 11 g/dL era del 81,7%; con ferritina sérica ≥ 100 ng/dL del 98,5%; con PTH 150-300 pg/mL del 31,9%; con albúmina > 3,5 g/dL del 75,6%; y con fósforo sérico < 5,5 mg/d del 70,6%. En la diálisis mostraron una media de Kt/V 1,4 ± 0,3 y de 11,7 ± 4 horas de tiempo de diálisis. Hubo uso de membranas de alta permeabilidad en el 52,3%, y el 74,0% de los pacientes utilizaron fístula arteriovenosa interna. Un 75% de los pacientes ancianos en hemodiálisis desarrollan actividades de la vida diaria normales para su edad, con parámetros adecuados de calidad de diálisis.

Palabras clave: Hemodiálisis. Ancianos. Calidad de vida. Acceso vascular. Adecuación de la diálisis.

Correspondence: *Á. L. M. de Francisco.*
Presidente de la Sociedad Española de Nefrología.
Servicio de Nefrología. Hospital Universitario Valdecilla. Santander.
martinal@unican.es

INTRODUCTION

The care of stage V chronic renal failure (CRF), which includes renal function replacement therapy, is considerably increasing in developed countries, ranging 5-10% annually. Among the most important reasons explaining this increase are population aging and the increase in type 2 diabetes mellitus. Population aging leads to both an increased prevalence of chronic disease and a great number of associated comorbid conditions, essentially cardiovascular in nature but also nutritional, neurological, osteoarticular, and social. Admission of elder patients into dialysis units is longstanding debate, with admission criteria that have been changing.[1,2] During the 1960s, patients older than 45 years were excluded from hemodialysis.[3] In the UK, until 1980 very few patients older than 60 years started on hemodialysis therapy.[4] In 1981 in Canada, only 25% of the patients receiving hemodialysis were older than 65 years. However, increased financing and technical progress have lead to old patients having no limitations for entering the dialysis lists. In recent years, the population older than 65 years is over 50%, so that in the last 2005 Spanish Report on Dialysis and Transplantation the incidence of patients older than 65 years on renal replacement therapy accounted for two thirds of the patients.[5]

The aim of this study was to describe the population of older (older than 65 years) and elderly patients (age ≥ 75 years) on hemodialysis therapy in Spain. The data studied pertained to demographics, cognitive functional assessment, CRF data, logistic issues of dialysis, and laboratory and dialysis adequacy data.

MATERIAL AND METHODS

We carried out an epidemiological, cross-sectional, multicenter, study including different Spanish dialysis units and a total of 1230 patients. Assessable patients for the statistical analysis were 1183 (96.2%), the data available for the analysis in the remaining patients being insufficient. Six hundred and twenty five were older than 65 years and 558 older than 75 years Sixty four point one percent of the patients belonged to extra-hospital centers.

The data gathered included gender, age, height, weight, BMI, concurrent pathology, socio-familial support, medication (number of capsules or tablets per patient), and global assessment of functional capacity and self-sufficiency: basic daily living activities (BDLA or Katz' index) and instrumental daily living activities (IDLA) (Lawton and Brody (LB) scale), as well as common activities according to the Karnovsky scale. We also recorded the time elapsed from diagnosis to entry into dialysis as well as the center referring the patient, etiology of CRF, the number of patients at each dialysis unit, and the commuting time to reach the center.

We recorded the last available data of hemoglobin, hematocrit, ferritin, transferrin saturation index, albumin, potassium, glucose, parathormone (PTH), phosphate, calcium, total cholesterol, and C reactive protein. We also recorded the number of hemodialysis hours per week, the membrane type, the type of vascular access, and the Kt/V (second generation Daurgidas).

We performed four types of sub-analyses according to hemoglobin (Hb) levels, age (< 75 or ≥75), vascular access (catheter or GAVF), and center where the dialysis unit is located (hospital or other).

The statistical analysis was performed by using the SPSS software, version 13.0. The t-test or Mann-Whitney test were used for quantitative variables comparison of independent samples (i.e., parametric or non-parametric tests, respectively, according to the sample). The chi-square test was used for comparing percentages. The results were considered to be statistically significant for a p value < 0.05.

RESULTS

Of the 1183 patients included, 678 were females (57.4%). Mean age was 75.4 ± 5.5 years, with a median of 75 and range 65-95. Six hundred and twenty five were older than 65 years and 558 older than 75 years. Diseases of the cardio-circulatory system were the most common concomitant pathologies (table I). 75.6% of the patients had arterial hypertension (values > 140/90 pre-dialysis). In the second place, 30% of the patients had Diabetes Mellitus, 23.5% of them with associated complications. Every patient had one or more comorbidities.

Eighty-five percent of the study patients lived in a fix family residence, this being similar in all subgroups, for both men and women younger and older than 75 years, the subgroup of female patients ≥ 75 years being the one presenting the lowest percentage (73%) (Table II). The rotary family residence was the most differing category, the frequency being higher among females ≥ 75 years (7.3%).

Poly-medication was measured as the number of tablets per day, with a mean of 7.9 ± 3.7 and a median of 7.0 (range 1-33). 48.1% of the patients took more than 8 pills per day, and 28% more than 10.

Several reference indexes were used for cognitive-functional assessment of the patients. About BDLA, assessed by means of the Katz' index, 66.6% of included patients were independent for the item «bathing themselves», 78.3% for the item «getting dressed», 85.5% for «using the WC», and about 81% for the «mobility» item, and over 90% independent for «sphincter control» and «feeding» (table I).

Considering a Katz' index ≤ 2 as severe functional impairment, 3-4 as moderate impairment, and 5-6 as full functioning, more than 75% of the patients were included in the last category. 13.8% of the studied population had severe functional impairment and the remaining 10.5% had moderate impairment. It is important to observe how appropriate anemia correction modifies these results (fig. 1a). 77.3% of the patients with hemoglobin ≥ 11 g/dL had full functioning with the proportion of patients with hemoglobin < 11 g/dL being significantly lower within this category (68.4%; p < 0.001).

The LB scale measured the IDLA: writing, reading, cooking, cleaning, using the telephone, using own money, and preparing the food. Patients are considered totally dependent when the scale equals 0, and totally independent when the score is the highest (8 points). The extreme values show that 8.5% of the patients are totally dependent whereas only 16.3% are totally independent (table I).

The Karnovsky' index measured the ability of a given patient to perform common tasks (table I). 23.7% of the patients

Table I. Patients characteristics

Demographics	Mean (median [range])
Age (years)	75.4 ± 5.5 (75, [65-95])
Body weight (kg)	65.1 ± 12.1
BMI (kg/m²)	25.5 ± 4.3

Sample data		**Patients**
Concomitant pathologies (prevalence > 15%; one or more per patient)	AHT	75.6%
	Peripheral vascular disease	29.0%
	Osteoarticular disease	27.3%
	Diabetes with complications	23.4%
	Wo. complications	5.6%
	CHF	20.5%
	Cerebrovascular disease	20.5%
	COPD	18.2%
	Myocardial infarction	17.2%
Assessment of functional capacity		**Patients**
Independence measured by the Katz' index	Bathing	66.6%
	Getting dressed	78.3%
	Using the WC	85.5%
	Commuting	80.7%
	Continence	91.5%
	Feeding	94.3%
Lawton and Brody Scale	8 Totally independent	16.3%
	0 Totally dependent	8.5%
Karnovsky Scale	**100** Asymptomatic	3.0%
	90-80 Normal life with more or less effort	37.6%
	70-60 Unabe to leading a normal life or taking care of one-self	34.8%
	50-40 Requires assistance of frequent medical care	23.5%
	30-10 Hospitalized and disable, extremely ill or dying	1.1%
Analytical and dialysis data		**Patients**
Hemoglobin (g/dL)	< 11	18.3%
	≥ 11	81.7%
Parathormone (pg/mL)	< 150	37.5%
	150-300	31.9%
	> 300	30.6%
Serum ferritin (ng/dL)	< 100	13.2%
	100-500	59.8%
	> 500	27.0%
Serum albumin (g/dL)	≤ 3.5	24.4%
	> 3.5	75.6%
Serum phosphate (mg/dL)	< 5.5	70.6%
	≥ 5.5	29.4%
Kt/V (2d gen. Daurgidas)	< 1.3	21.9%
	≥ 1.3	78.1%

led a normal live with some effort or had some sign or symptom (score of 80). Once again, correcting anemia has a significant effect. 22.7% of the patients with hemoglobin levels ≥ 11 g/dL had Karnovsky' s index ≤ 50 whereas 32.6% of the patients with that score had hemoglobin levels < 11 g/dL ($p < 0.046$). Only 0.3% of the whole population was severely ill or dying (scores 10-20).

Table II. Socio-familial support

Gender	**Male**		**Female**	
Sample's age	**< 75**	**≥ 75**	**< 75**	**≥ 75**
Lives alone, without any help	5.1%	3.2%	2.7%	7.7%
Lives alone, with home assistance (social worker)	1.1%	1.0%	2.3%	4.0%
Lives with care-giver, no relative	0.8%	1.0%	2.7%	1.2%
Fixed family residence	89.7%	87.3	86.7%	73.0%
Rotary family residence	0.5%	1.6	2.0%	6.9%
Lives in nursing home	2.7%	5.8	3.5%	7.3%

Data on chronic renal failure

The time elapsed from diagnosis of CRF until dialysis onset was calculated as the difference between the date of dialysis onset and the date of disease diagnosis. In this way, the time elapsed until dialysis for the study population was 4.2 ± 4.9 years (median 2.8 years; range 0-28.5 years).

Most of the patients (57.2%) attending the Nephrology Unit had been referred by their family doctor. Other referring departments were Urology (7.8%), Internal Medicine (6.7%), Emergency Department (5.6%), Endocrinology (4.3%), and Cardiology (2.7%).

The data recorded on CRF etiology reproduce the prevalence observed in the general hemodialysis population in our country, with 21.2% of the cases with diabetic nephropathy, which is similar to that corresponding to vascular renal disease for this age range (20.9%).

The description of the logistic characteristics pointed out that 46.4% of the patients included attended a dialysis unit with a number of patients ranging 50-100. The mean number of patients per Unit was 102.3 ± 53.3; the time required to commute to the unit was ≤ 1 hour in 87.5% of the patients. About 57% of them are taken to dialysis by ambulance, whereas 37.0% do so by taxi, 5.4% by their own or the familial care, and only 0.8% by public transportation. The mean time of hemodialysis sessions was 11.4 ± 4.0 hours per week, with a median of 12 hours.

Table I shows the descriptive statistics on the available analytical data. The percentage of patients with Hb ≥ 11 g/dL was 81.7%; 98.5% had serum ferritin levels ≥ 100 ng/dL (59.8% showed optimal levels of 100-500 ng/dL). 31.9% of the patients had PTH levels within the range of 150-300 pg/mL; 75.6% had albumin levels > 3.5 g/dL; 70.6% had phosphate levels < 5.5 mg/dL. Besides, the percentage of incident patients with usable vascular access, either by autologous or prosthetic GAVF, was 78.8%. Taking into account the set of indicators proposed by the Quality Management Working Group of the Spanish Society of Nephrology, [6] all the measures in our sample exceed the standards established, and thus the patients have been properly monitored at their corresponding dialysis units.

During dialysis, high-permeability membranes were used slightly more frequently than low-permeability membranes (52.3% *vs* 47.7%).

Data on vascular access

In 74% of the patients the vascular access was performed through a native internal arterial-venous fistula (GAVF), 21.2%

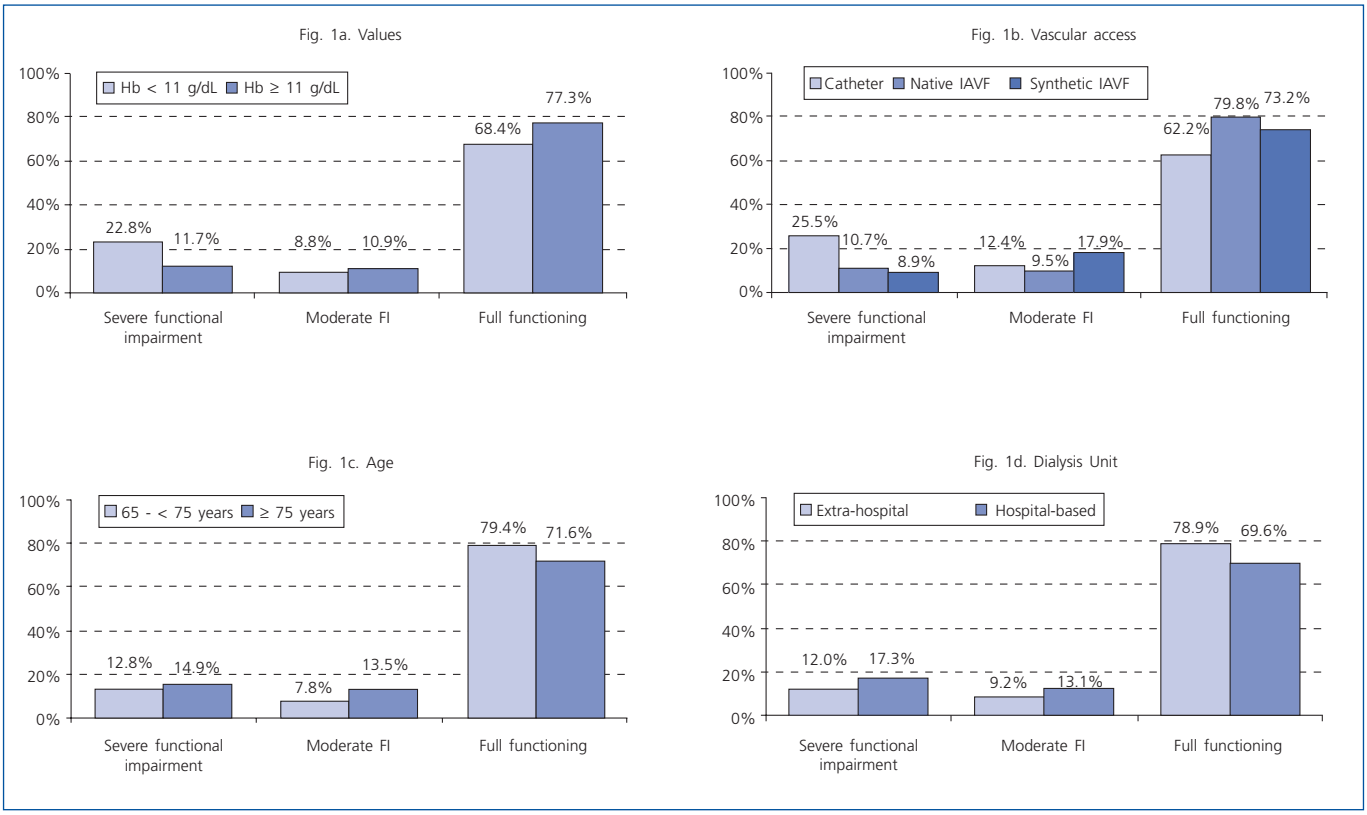

Figure 1. Functional capacity of the four sample subpopulations. It was considered that patients had severe functional impairment when the Katz' index was ≤ 2, moderate 3-4, and full functioning 5-6. In general, more than 75% of all patients had full functioning although it is interesting to point out how appropriate anemia correction by subpopulations improves these results. All the percentages were statistically significant.

carried a catheter, and 4.8% synthetic GAVF ($p < 0.05$). The statistical report showed the differences by gender and the vascular access used (table III). Thus, vascular access with native GAVF was performed in 61.3% of male patients and in 38.7% of females ($p < 0.001$). It is also interesting to highlight that the type of vascular access conditioned the indexes obtained in the global assessment of the functional capacity and self-sufficiency (Katz and LB, $p < 0.001$; Karnovsky, $p < 0.005$) (table III). A higher percentage of patients with full functioning was observed in the group with native GAVF (79.8%), followed by synthetic GAVF (73.2%), and catheter in the last place (62.2%). The subpopulation with catheter was the one presenting the highest percentage of severe functional impairment: 25.5% vs. 10.7% (native GAVF) and 8.9% synthetic GAVF (fig. 1b).

Similarly, a significant relationship was found between some analytical parameters and the type of vascular access. Thus, mean hemoglobin level in patients carrying a catheter was 11.8 ± 1.6 g/dL vs. 12.2 ± 1.3 g/dL for those with native GAVF and 11.9 ± 1.2 g/dL with synthetic GAVF ($p < 0.001$). For serum albumin, the differences were significant between the subpopulation with catheter (3.7 ± 0.6 g/dL) and GAVF, both native and synthetic (3.9 ± 0.4 g/dL for both; $p < 0.001$) (table III). In addition, differences were found for the mean value of the Kt/V index between the three groups ($p < 0.001$). The mean dialysis dose (Kt/V index, according to blood analysis and second generation Daurgidas) was 1.4 ± 0.3 for both catheter and native GAVF, which is in agreement with median values (minimum 0.5 and maximum 2.0, for both). The mean Kt/V index for synthetic GAVF was 1.5 ± 0.2 (median 1.5 and range 1.0-2.0) (table III).

Comparative study by age groups

The comparison between older patients (aged 65-75 years) and elderly patients (older than 75 years) showed statistically significant differences between demographical factors, such as socio-familial support, and functional capacity and self-sufficiency (table IV). Weight and BMI varied by age of the patients ($p < 0.001$), with lower values for those ≥ 75 years. As previously mentioned, more than 80.0% of the patients in both subpopulations live in a permanent family residence, this frequency being higher in those younger than 75 years (88.5% *vs* 80.9%; $p < 0.005$). Differences were also found in the number of pills/tablets consumed by the patients in both subpopulations (mean of 8.3 ± 3.7 in those < 75 years and 7.5 ± 3.6 in those ≥ 75 years; $p < 0.005$).

About the daily living activities, the global mean score for the Katz' index was 5.1 ± 1.7 in the younger group and 4.8 ± 1.8 in the older one. 79.4% of the patients younger than 75 years had full functioning, this percentage being lower in those older than 75 years (71.6%) (fig. 1c). Thus, it is important to point out a direct and significant relationship ($p <$

Table III. Characteristics by vascular access

Demographical distribution		Catheter	Native GAVF	Synthetic GAVF
Gender	Male	47.4%	61.3%	39.3%
	Female	52.6%	38.7%	60.7%
Daily living activities		**Catheter**	**Native GAVF**	**Synthetic GAVF**
Lawton and Brody Scale	**8** Independent	11.6%	17.6%	17.9%
	0 Dependent	14.3%	7.1%	3.6%
Karnovsky's Scale	**100** Asymptomatic	1.2%	3.5%	3.6%
	90-80 Normal life with more or less effort	29.9%	40.0%	32.1%
	70-60 Unable to lead a normal life or taking care of one-self	32.2%	35.4%	39.3%
	50-40 Requires assistance of frequent medical care	33.8%	20.7%	23.2%
	30-10 Hospitalized and disable, extremely ill or dying	2.0%	0.3%	1.8%
Laboratory and dialysis data		**Catheter**	**Native GAVF**	**Synthetic GAVF**
Hemoglobin (g/dL)		11.8 ± 1.6	12.2 ± 1.3	11.9 ± 1.2
Transferrin saturation (%)		25.3 ± 11.6	28 ± 12.6	28.4 ± 11.0
Serum albumin (g/dL) 3,7 ± 0,6		3.9 ± 0.4	3.9 ± 0.4	
Kt/V (2d generation Daurgidas)		1.4 ± 0.5	1.4 ± 0.5	1.6 ± 1.0

Table IV. Characteristics by age

Patients		< 75	≥ 75
Gender	Male	59.0%	55.4%
	Female	41.0%	44.6%
Weight (kg)		67.0 ± 12.3	63.0 ± 11.5
BMI (kg/m^2)		26.0 ± 4.5	25.0 ± 4.1
Katz' index (global mean)		5.1 ± 1.7	4.8 ± 1.8
LB scale (global mean)		4.7 ± 2.6	3.8 ± 2.5
Sample's data		**< 75**	**≥ 75**
Lawton and Brody Scale	**8** Independent	21.2%	11.5%
	0 Dependent	5.8%	10.8%
Karnovsky's index	**100** Asymptomatic	2.9%	3.2%
	90-80 Normal life with more or less effort	43.1%	31.1%
	70-60 Unable to lead a normal life or taking care of one-self	32.1%	37.9%
	50-40 Requires assistance of frequent medical care	20.6%	27.0%
	30-10 Hospitalized and disable, extremely ill or dying	1.3%	0.8%
Laboratory and dialysis data		**< 75**	**≥ 75**
Ferritin (ng/mL)	< 100	12.3%	14.2%
	100-500	63.3%	55.8%
	> 500	24.4%	29.9%
Phosphate (mg/dL)	< 5.5	67.3%	74.4%
	≥ 5.5	32.7%	25.6%
Vascular access	Catheter	18.9%	23.9%
	Native GAVF	75.2%	72.7%
	Synthetic GAVF	5.9%	3.4%

0.005) between age and impairment (the higher the age the greater the impairment).

Similarly, the score obtained in the LB scale presents differences between both subpopulations of patients analyzed, with a mean of 4.7 ± 2.6 in those < 75 years, and 3.8 ± 2.5 in those > 75 years (Table IV). The frequency of totally dependent patients was higher in those ≥ 75 years (11.5%) as compared with those < 75 years (5.8%). On the opposite side, the frequency (10.8%) of totally independent patients among those ≥ 75 years was lower than that in those < 75 years (21.2%), i.e., the higher the age, the greater the dependency ($p < 0.001$).

About the Karnovsky' s index, it was observed that although the percentage of patients with a score of 80 is high in both subpopulations, 21.9% of those younger than 75 years had a value below 50, whereas this percentage was 27.8% in those older than 75 years ($p < 0.005$) (table IV).

Additionally, the subpopulation analysis showed that the most common cause of CRF among patients < 75 years was diabetic nephropathy (26.4%), whereas in those patients ≥ 75 years the most common cause was vascular renal disease (23.6%; $p < 0.001$) (fig. 2).

On the other hand, we did not find statistically significant differences by age for logistic issues of dialysis, dialysis duration (12 hours for both groups) or type of membranes used.

Differences were found between both subpopulations for analytical parameters (table IV). Serum ferritin was 100-500 ng/dL in 63.3% of the patients < 75 years and in 55.8% in those > 75 years ($p < 0.05$). Besides, 67.3% of the patients < 75 years had serum phosphate levels < 5.5 mg/dL, whereas this percentage increased to 74.4% in those > 75 years ($p < 0.05$).

Once again, the type of vascular access produced differences, here by age, with higher frequency of catheters in the older group (23.9% vs. 18.9%; $p < 0.05$). Native GAVF was the most used type in both groups (table IV).

Differences by hospital-based and outpatient centers

Although the mean age of the patients was similar in the groups of hospital-based and outpatients (75.4 ± 5.5 and 75.4 ± 5.6 years, respectively), differences were detected in the type of vascular access used depending on the center type ($p < 0.05$). Catheters were more frequently used at hospitals (24.2% *vs* 19.7%), whereas synthetic GAVFs were more frequently used at outpatient centers (5.9% *vs* 2.6%). Native GAVF was the type of vascular access most frequently used in both groups (74.5% and 73.2%).

We also observed differences by center type for assessment of the functional capacity and self-sufficiency. Patients at extra-hospital centers were more independent than those at-

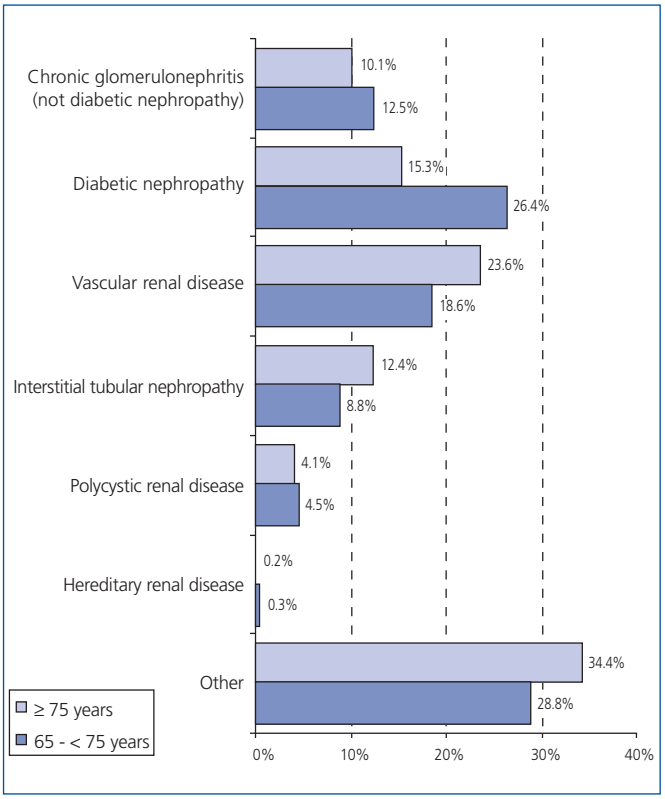

Figure 2. Cause of CRF by age. In patients < 75 years the most common cause was diabetic nephropathy and in those ≥ 75 years it was vascular renal disease. All the percentages were statistically significant.

tending hospital-based centers for every item of the BDLA (table V).

Concerning dialysis logistics, the mean number of patients attended at extra-hospital dialysis units was 120.1 ± 55.9 whereas at hospital-based units this number was reduced to 71 ± 29.4. Besides, in the hospital-based group, the most common way of transportation was by ambulance (75.8%), whereas in the extra-hospital group the most common transportation means were by ambulance and taxi (45.6% and 48.5%, respectively; $p < 0.001$) (table V).

Besides, differences were shown in the percentage of extra-hospital patients with serum albumin levels >3.5 g/dL, *vs* hospital-based patients (78.2% *vs* 71.2%; $p < 0.02$); as well as in those with a Kt/V index ≥ 1.3 (83.4% *vs* 68.1%; $p < 0.001$).

DISCUSSION

This multicenter analysis carried out at both hospital-based and extra-hospital dialysis center summarizes the current reality of patients older than 65 years on hemodialysis therapy in Spain. The importance of gathering these data partly resides in the continuous increase of average age among individuals starting on hemodialysis, being especially important in those patients older than 75 years. These patients present a different pattern for three reasons: first, their inclusion in the renal transplantation waiting list is proportionally lower; second, performance of home-based dialysis or automated peritoneal dialysis at home is difficult; and third, because they present higher dependency on social services. Besides, they show higher frequency of hospitalization. Another important reason justifying this study is the need to make clear what is the quality of life in these patients, as well as the efficiency of health care costs, with a special interest in those older than 75 years. Data from the United Kingdom estimate that 1% of health care expenditures are dedicated to renal function replacement, and that twice this amount will be required to benefit all patients requiring so in the future.[7] However, it does not seem that treatment costs in the elderly on dialysis are higher that those in the general population.[8]

The study includes a very old population: mean 75.4 ± 5.5 years, median 75 years, and maximum age of 95 years. Due to its design, included prevalent patients, mortality issued cannot be analyzed. It may be stated, however, that the mortality among elderly patients during start of hemodialysis therapy is high. According to the data from the 1998 US Renal Data System 1998, 18% to 26% of the elderly patients could not reach three months of therapy because they died during this period.[9] Although this percentage could be lower in our country, we should point out that it is very likely that a percentage of patients not included in this study could precisely be that with the highest risk. It seems obvious that age is one of the most important determinant factors in the patients course. However, in the elderly (> 75 years), the life expectancy could be independent of patient's age at the beginning of dialysis therapy.[10] It is so that currently acceptance of elderly patients into dialysis programs has not a clear-cut limit, which implies considerable ethical, social and financial issues.[11]

It is important to consider that chronic renal disease is accompanied by a high incidence of other conditions so that the results obtained in this old population occur in the setting of a high incidence of comorbid conditions. Seventy five percent

Table V. Characteristics by dialysis unit

Patients		**Extra-hospital**	**Hospital**
Age (years)		75.4 ± 5.5	75.4 ± 5.6
Kazt' index (global mean)		5.1 ± 1.6	4.7 ± 1.9
Sample's characteristics		**Extra-hospital**	**Hospital**
Lawton and Brody Scale	**8** Independent	17.2%	15.0%
	0 Dependent	7.4%	10.5%
Karnovsky's Scale	**100** Asymptomatic	4.3%	1.0%
	90-80 Normal life with more or less effort	34.7%	41.8%
	70-60 Unable to lead a normal life or taking care of one-self	37.6%	30.2%
	50-40 Requires assistance of frequent medical care	22.7%	25.4%
	30-10 Hospitalized and disable, extremely ill or dying	0.6%	1.6%
Means of Transportation	Ambulance	45.6%	75.8%
	Family or own vehicle	5.6%	5.0%
	Taxi	48.5%	17.3%
	Public (not taxi)	0.3%	1.9%

present hypertension, 29% peripheral vascular disease, 20.5% heart failure, 20.5% cerebrovascular disease, and 17% myocardial infarction in addition to other associated complications. Other studies performed in hemodialysis population older than 65 years have shown that 90% of these patients have two or more comorbidities.[12] These data highlight the high dedication and experience needed in caring for these elderly patients on hemodialysis. From a sociological viewpoint, it is interesting to underline that 85% of the study patients live in a fixed family residence, an instance that is likely not to occur in other countries due to cultural reasons.

Focusing on the number of tablets prescribed to these patients, 48.1% of them received more than 8 tablets/day and 28% more than 10. This raises the question of whether dialysis patients really take their prescribed medication due to the low adherence rates (close to 50%) reported in other asymptomatic chronic pathologies, such as arterial hypertension. (Studies on hemodialysis patients show that more than 42% of those older than 65 years and 47% of those younger than 65 years did not adhere to antihypertensive therapy. Similarly, 65% of the elderly and 80% of those younger than 65 years did not comply with prescription of phosphate chelating agents).[13] Most of the reasons for not adhering (lack of benefit perception and motivation, frequent dosing, etc.) are present in the hemodialysis population, which makes us doubt about the intake of the 8 pills prescribed per day, an appreciation that is not exclusive of elderly patients.

An essential issue in the descriptive of this study is the functional status of the patients. When analyzing the Katz' index, which assesses the capacity to perform self-care, more than 75% of the patients presented full functioning. 13.8% of the study population had severe functional impairment, and the remaining 10.5% had moderate impairment. In addition, the Lawton's index, measuring a range of more complex activities, shows that 16.3% are totally independent, a percentage that goes up to 37% when adding those limited in 1 or 2 activities. The values obtained with the Karnovsky' s index show similar results. Thus, we may conclude that in this group of aged patients on hemodialysis, their functional capacity is acceptable. The clear differences between patients older than 75 years and those aged 65-75 years, between those carrying catheters or GAVF, and between those receiving extra or intrahospital therapy are notable.

Late referral is an important factor determining a poor course in dialysis patients,[14] a fact that has been demonstrated in our country.[15] In a prospective study using SF 36, Loos et al.[16] showed that elderly dialysis patients with late referral had low quality of life as compared to those early referred to Nephrology units. In the group presented at our work, the time elapsed from diagnosis of CRF until dialysis onset was 4.2 ± 4.9 years, with a median of 2.8 years. That is to say, most of the patients included, with some logical exceptions, seem to have received appropriate nephrologic care for a sufficient time. Both factors could have had an impact on the results obtained.

About how patients were referred to the nephrologists, the percentage of patients referred by the primary care doctor was similar to the rest of Europe (almost 60%).

In an effective way, the percentage of late referrals is lower when the patients are referred by their primary care doctor than when they do so by other specialists such as cardiologists, internists, or diabetologits.[17] These data reveal the importance of the work performed at the Primary Care Centers in trying to identify occult renal disease (low filtration rates with normal creatinine), and emphasize the need for prevention programs and early referral to Nephrology. Before the increase of chronic renal disease, scientific societies should endorse the onset of prevention programs in order to avoid progression, and especially the cardiovascular complications.

To examine the analytical data of the elderly population, we compared them with the minimal set of global indicators from the Clinical Guidelines for Hemodialysis Centers published by the Spanish Society of Nephrology and that incorporate quality management in hemodialysis.[6] The ranges of hemoglobin, ferritin, PTH, phosphate, and mean and median Kt/V, among others, fall within the recommended standard. We did not find significant differences between patient's age and the mean of the following analytical parameters studied: hemoglobin, hematocrit, ferritin, transferrin saturation index, albumin, potassium, glucose, PTH, calcium, total cholesterol, reactive C protein, and Kt/V. However, when we analyzed optimal values, there are statistically significant differences in the percentages of patients with ferritin ranges (≥ 100 ng/dL) and albumin (> 3.5 g/dL) by age.

The vascular access is the key for appropriate dialysis therapy, partly because it still is an important morbidity cause among treated patients. It is estimated that age, gender, obesity, chronic disease with multiple hospital admissions, and repeated punctures may be related with a poorer vascular access. However, in a Spanish series of patients from Aragon and Northern Spain,[18] categorization by patient's age did not show differences in the number of vascular accesses. The opposite was found in another Spanish series in which patients older than 65 years more frequently required vascular prostheses.[19] In our series of patients older than 65 years, we observed that 79% had accessible fistula, which falls within the quality goals for a center, although the prevalence of catheters was slightly higher in the group of patients older than 75 years.

To conclude, the results of this study fully justify the dedication, medical effort, and financial costs of management of hemodialysis patients older than 65 and 75 years.

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