

Original research

Presumptive chronic kidney disease in elderly adults

Enfermedad renal crónica presuntiva en adultos mayores

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Abstract

Introduction: Chronic kidney disease (CKD) in older adults is highly prevalent and is associated with multiple risk factors.

Objective: To identify elderly patients with CKD who attend the nephrology outpatient clinic at the Comprehensive Community Health Center (CSIC) Chacaltaya, El Alto, Bolivia, in the period between September and December 2018.

Materials and methods: Observational, descriptive and cross-sectional study performed in an outpatient nephrology clinic in CISC Chacaltaya, El Alto, Bolivia. The universe was 203 patients. The following variables were analyzed: age, sex, marital status, occupation, personal pathological background, classification of CKD. The formula Modification of Diet in Renal Disease was abbreviated to determine the degree of the disease. To give an exit, descriptive statistics were used (absolute and relative frequencies, chi-square test). Informed consent was taken into account.

Results: Stage 2 of the disease prevails, with 44.3%, followed by stage 3a, with 21.7%; it was more prevalent in the age group of 70-79 years and more in women than in men. The risk factors that are related to chronic kidney disease in our study were age, female gender, diabetes mellitus and malnutrition by excess, proteinuria and anemia.

Conclusions: CKD presents a high prevalence in the population over 60 years of age; its early diagnosis plays an important role in its integral approach at the primary health level.

Key words: Renal insufficiency, chronic, aged, glomerular filtration, morbidity, epidemiology, primary health care.

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Resumen

Introducción: la enfermedad renal crónica (ERC) en los adultos mayores es altamente prevalente y se asocia a múltiples factores de riesgo.

Objetivo: identificar pacientes adultos mayores con ERC que acuden a la consulta ambulatoria de nefrología en el Centro Integral de Salud Comunitaria (CSIC) Chacaltaya, El Alto, Bolivia, en el período comprendido entre septiembre y diciembre de 2018.

Materiales y métodos: estudio observacional, descriptivo y transversal realizado en consulta ambulatoria de nefrología en el CISC Chacaltaya, El Alto, Bolivia. La muestra fue de 203 pacientes. Se analizaron las variables edad, sexo, estado civil, ocupación laboral, antecedentes patológicos personales, clasificación de la ERC. Se utilizó la fórmula *Modification of Diet in Renal Disease* abreviada para determinar el grado de la enfermedad. Se utilizó la estadística descriptiva (frecuencias absolutas y relativas, prueba Chi-cuadrado) y se tuvo en cuenta el consentimiento informado.

Resultados: prevalece el estadio 2 de la enfermedad, con 44,3 %, seguido del estadio 3a, con 21,7 %, fue más prevalente en el grupo de edad de 70-79 años y más en las mujeres que en los hombres. Los factores de riesgo que se relacionan con la enfermedad renal crónica en nuestro estudio fueron: edad, sexo femenino, diabetes mellitus, malnutrición por exceso, proteinuria y anemia.

Conclusiones: La ERC presenta una alta prevalencia en la población mayor de 60 años, su diagnóstico precoz tiene un papel importante en el abordaje integral de la misma en el nivel primario de salud.

Palabras clave: enfermedad renal crónica, adulto mayor, filtrado glomerular, epidemiología, atención primaria de salud.

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Introduction

Chronic kidney disease (CKD) is a well-defined clinical entity, secondary to multiple etiologies with risk factors common to other chronic non-communicable diseases (CNCDs) - an ageing population that is constantly increasing, with chronic diseases on the rise at the expense of diabetes mellitus (DM) and arterial hypertension (AHT) and the presence of more than one disease in the same patient - which, if it is not timely identified, inexorably leads to end-stage chronic kidney disease (end stage CKD) requiring renal replacement therapy (RRT) or substitutive (RST) by dialysis or renal transplantation in the presence of irreversible renal functional damage.

CKD is defined as the structural or functional damage of the kidney, evidenced by renal damage markers (urine, blood or images) for a period equal to or longer than 3 months, or by a theoretical glomerular filtration rate (tGFR) lower than 60 ml/min regardless of the cause. It is stratified into five stages.¹ The purpose of this classification is to identify patients with CKD from its earliest stages, establish measures to slow its progression, reduce morbidity and mortality and, where appropriate, prepare patients for dialysis.² The global burden of kidney disease varies substantially across the planet, as well as its detection and treatment. Although the magnitude and impact of kidney disease is better defined in developed countries, recent evidence suggests that developing countries have a similar or even greater disease burden than the former.³ In many scenarios, the rates of kidney disease and the provision of care are defined by socio-economic, cultural and political factors, causing significant disparities in the disease burden, even in developed countries.⁴ These disparities exist across the entire spectrum of kidney disease - from preventive efforts to limit the development of acute kidney injury or chronic kidney disease, to screening for kidney disease among people at high risk of developing it, and access to subspecialized care and treatment of renal failure with renal replacement therapy.⁵

In the general adult population, it is estimated that approximately 8 to 10% (1 in every 10 people) have

some kidney damage, evidenced by the presence of proteinuria or microalbuminuria; if hematuria is included as a marker of kidney damage, this figure increases up to 18%.^{2,6} In those individuals over 60 years it is estimated at 20%.⁷ Therefore, kidney disease is a global health problem that affects more than 750 million people around the world.^{5,8} According to data of the Study of Global Burden of Kidney Disease, approximately 1.2 million people died of CKD in 2015,⁹ and more than 2 million people died in 2010 because they had no access to dialysis. It is estimated that another 1.7 million die from acute renal failure annually.^{10,11} It is possible, therefore, that chronic kidney disease contributes to the increased mortality of the main chronic non-communicable diseases to which the current action plan for CNCD points.¹²

In Latin America, as in almost the whole world, the availability of information that reflects the total burden of kidney disease varies substantially due to limited or inconsistent data. While several countries have data collection systems, particularly for the end-stage kidney disease, the information on pre-dialysis chronic kidney disease is very limited and, often, its quality is quite variable in configuration.

According to data from the Latin American Dialysis and Renal Transplant Registry of 2017,¹³ in the region, the number of prevalent patients on renal function substitution therapy amounted to 147,771, with an annual incidence rate of 149 per million people (pmp) and a prevalence rate of 669 pmp, being Panama, Puerto Rico and the state of Jalisco in Mexico the countries with the highest incidence rate, exceeding 400 patients per million people, while the highest prevalence rates of patients on RST are registered in Puerto Rico, the state of Jalisco and Chile, exceeding 1000 pmp.

In Bolivia, according to the report of the Latin American Dialysis and Transplant Registry,¹³ at the end of 2017 there were 2220 patients undergoing renal function substitution therapy, with an incidence rate of 94.8 pmp and a prevalence of 245.1 pmp; one of the lowest rates in the region, which in the opinion of the authors is due to the under-registry of patients, given that only the data of patients with medical insurance are reflected.

In summary, the incidence and prevalence of patients on RRT continues to increase, even though renal transplantation is a feasible, available and increasingly used modality for RRT in all Latin American countries.

All this exponential increase is associated with advanced age, in which there is a physiological deterioration of renal function, and also with risk factors such as diabetes, hypertension, smoking habit and obesity.¹⁴

Various clinical and necropsic studies have shown that the kidney undergoes a series of histological and functional changes with aging.

From the fourth decade of life there is a decrease in GFR of one ml/min/year, which in the majority of the elderly reduces the renal mass and a higher percentage of sclerosed glomeruli is observed in direct relationship to the passage of the years, to which could be added the presence of diseases that by themselves are capable of damaging the functional structures of the kidney.¹⁵ After 70 years of age, the average of sclerosed glomeruli is 10 to 20%, but it is not uncommon to observe percentages > 30% in subjects over 80 years without known kidney diseases.¹⁶

CKD generates numerous health expenses and it is difficult to estimate these costs at early stages, since the vast majority of studies are referenced in the substitution therapy or transplant. In addition, this pathology has a great impact on the individuals, their families and society, associated with a high cardiovascular morbidity and mortality that increases health costs.¹⁷

In Bolivia, the economic constraint has been the main barrier to the management of these patients, since around USD \$ 600 are required for a month of treatment, however the modification of Law 475 and the promulgation of Supreme Decree 1870 have allowed an increase of 40% in renal transplant surgeries and that 2800 patients received hemodialysis for free since 2014.^{18,19}

In accordance with the above-mentioned, the present work was designed with the objective of

identifying morbidity and risk factors that lead to the progression of chronic kidney disease, differentiating them by age and sex in the older adults treated in the nephrology outpatient clinic at the Comprehensive Community Health Center (CSIC) Chacaltaya, in the city of El Alto, La Paz, Bolivia, in the period between September and December 2018.

Materials and methods

An observational, descriptive, cross-sectional study was conducted in patients over 60 years of age who attended the nephrology outpatient clinic at the Chacaltaya Comprehensive Community Health Center, in the city of El Alto, Department of La Paz in Bolivia between the months of September and December 2018.

Inclusion criteria

- Patients over 60 years of age who attended the nephrology outpatient clinic at the Chacaltaya Comprehensive Community Health Center.
- Those who have clinical laboratory tests of serum creatinine.
- With and without risk factors for decreased glomerular filtrate.
- Adequate mental and cognitive status.
- Patients who gave their consent to participate in the study.

Exclusion criteria

- Patients who are not in the reference age group.
- Those who do not have results of clinical laboratory tests.
- Patients who did not grant their consent to participate in the study.

Taking into account the inclusion and exclusion criteria, we worked with a total of 203 patients,

represented by men and women over 60 years of age.

A single assessment was performed in older adults, coinciding with a visit to the outpatient nephrology clinic. All patients were evaluated clinically and analytically. Data on age, sex, marital status, occupation, personal pathological antecedents (diabetes mellitus, hypertension, obstructive nephropathy) and physical examination (blood pressure, weight and height) were collected. In venous blood: serum creatinine, hemoglobin, hematocrit, fasting blood glucose and a general urine test (proteinuria).

Subsequently, we proceeded to calculate the body mass index (BMI) and estimate glomerular filtration according to three formulas established by the K/DOQI guidelines²⁰ the Cockcroft-Gault formula, MDRD-4 (abbreviated) and CKD-Epi; once the results of the glomerular filtration rate were obtained, CKD was staged based on the criteria of the Kidney Disease Outcomes Quality Initiative Guidelines²⁰ and the KDIGO guidelines.²¹

Statistical analysis

A computerized database was created in Microsoft Excel. The statistical analysis was performed with the SPSS 11.0 and EpiCal software. The data were expressed in summary measures (percentages, means, standard deviation), the Chi-square test to verify if there was a significant association between the variables involved, and the relative risk (RR) to measure the strength of association between exposure and disease, which indicates the probability of developing this disease in those exposed to a risk factor in relation to the unexposed group. If this risk includes the value one, it can be concluded that the risk is statistically significant $p < 0.05$, with a 95% confidence interval, outputting the results through tables.

Ethical aspects

Patient identification data were respected. After assuring each participant the confidentiality of the study, voluntariness and informed consent were

collected to be included therein. At the conclusion of the study, each patient was informed of the results and the pertinent indications were given in each case.

Results

The information related to the sociodemographic characteristics, risk factors and renal function of the 203 participants in the study is shown in Table 1, the mean age was 68.8 years with a variability of ± 6.8 years. Of the enrolled, 117 were men (57.6%) and 86 women (42.4%). Regarding personal pathological antecedents, 53 patients had a history of arterial hypertension (26.1%) and 35 patients had a diagnosis of diabetes mellitus (17.2%). The mean serum creatinine was 1.4 mg/dl (SD ± 0.8). The mean estimated glomerular filtration rate of each of the formulas used (Cockcroft-Gault, MDRD-4 (abbreviated) and CKD-Epi) was 65 ml/min (SD ± 25.8), 66 ml/min (SD ± 26.5) and 68 ml/min (SD ± 22.3) respectively.

The classification of CKD in the older adult population investigated is presented in Table 2, where there was a predominance of stages 2 and 3a, respectively in any of the formulas used: Cockcroft-Gault (stage 2: 36.0%; stage 3a: 28.1%), MDRD-4 (stage 2: 44.3 %; stage 3a: 21.7%) and CKD-Epi (stage 2: 41.9%; stage 3a: 26.6 %).

To relate the classification of CKD with sociodemographic characteristics, risk factors and personal pathological antecedents, we used the results obtained by the MDRD-4 formula (Table 3). In relation to age, the greatest contributions were observed in the group of 70 to 79 years, with 45% of patients in stage 2 of the disease, followed by stage 3a with 29.4%. However, the X2 test was not significant ($p > 0.05$), so there is no sufficient evidence to suggest an association between age and the evolution of the disease. Regarding sex, although there was a predominance of men (57.4%) over women (42.4%) in the sample, kidney disease was more prevalent in females, with the greatest contributions in stage 2 (45.3%), followed by the 3a (29.1%). However, the X2 test did not yield a significant difference ($p = 0.536$).

Table 1. Sociodemographic characteristics, risk factors and renal function according to the study group. El Alto, Bolivia. September-December, 2018.

Age (years) (mean, SD)	68,8	± 6,8
Sex (male/female) (n, %)	117/86	57,6/42,4
Marital status (married/single/widower) (n, %)	112/67/24	55,2/33,0/11,2
Occupation (with/without employment) (n, %)	93/110	45,8/54,2
Body weight (Kg) (mean, SD)	67,1	±11,3
Height (cm) (mean, SD)	153	± 9,2
Arterial hypertension (n, %)	53	26,1
Blood pressure (mmHg) (mean, SD)	128/77	± 19,3/10,3
Diabetes mellitus (n, %)	35	17,2
Fasting glycemia (mg/dl) (mean, SD)	5,9	± 2,6
Hemoglobin (g/l) (mean, SD)	15,8	± 2,0
Creatinine (mg/dl) (mean, SD)	1,4	± 0,8
Glomerular filtrate Cockcroft-G (ml/min) (mean, SD)	65	± 25,8
Glomerular filtrate MDRD-4 (ml/min) (mean, SD)	66	± 26,5
Glomerular filtrate CKD-Epi (ml/min) (mean, SD)	68	± 22,3
Proteinuria (mg/g) (n, %)	51	25,1

Table 2. Stratification of patients with presumptive chronic kidney disease according to mathematical formula. El Alto, Bolivia. September-December, 2018.

Mathematical equations to estimate glomerular filtration			
Stages of CKD	Stages of CKD	Stages of CKD	Stages of CKD
1	16,7	17,7	20,7
2	36	44,3	41,9
3a	28,1	21,7	26,6
3b	13,8	5,5	5,5
4	3,4	3,4	3,4
5	2	2	2

In relation to the marital status of the patients studied, we see that stage 2 predominated in single individuals over married and widowers (47.8%) followed by stage 3a with 28.4%. No significant association was found between these variables ($p =$

0.863). In terms of occupation, patients with employment predominated in stages 2 and 3a of the disease, while those without employment were more prevalent in stages 3a and 3b. Similar results are seen when relating renal disease to nutritional sta-

Table 3. Percentage distribution of the patients studied according to sociodemographic variables and risk factors. El Alto, Bolivia. September-December, 2018.

Variables	Categories	Stages of kidney function						p<0,05 CI (95 %)
		1	2	3a	3b	4	5	
		(%)	(%)	(%)	(%)	(%)	(%)	
Age (years)	60 - 69	18,4	44,7	26,3	4,4	3,5	2,6	0,897 (0,866-0,946)
	70 - 79	16,6	45,6	29,4	4,4	2,9	1,5	
	= 80	19	31,8	23,8	14,3	4,8	0	
Sex	Female	12,8	45,3	29,1	7	4,7	1,2	0,536 (0,483-0,620)
	Male	21,4	43,6	25,6	4,3	2,6	2,6	
Marital status	Married	17	44,6	26,8	5,4	3,6	2,7	0,863 (0,872-0,950)
	Single	14,9	47,8	28,4	6	3	0	
	Widower	29,2	33,3	25	4,2	4,2	4,2	
Occupation	With employment	18,2	45,5	26,4	3,6	4,5	1,8	0,789 (0,765-0,871)
	Without employment	17,2	43	28	7,5	2,2	2,2	
Nutritional status	Low weight	0	0	0	0	0	0	0,691 (0,636-0,763)
	Normal weight	19	47,6	19	7,1	2,4	4,8	
	Overweight	13,7	43,2	31,6	5,3	4,2	2,1	
	Obese	22,7	43,9	25,8	4,5	3	0	
Arterial hypertension	Yes	13,2	39,6	26,4	7,5	7,5	5,7	0,068 (0,190-0,790)
	No	19,3	46	27,3	4,7	2	0,7	
Diabetes mellitus	Yes	34,3	20	17,1	11,4	11,4	5,7	0 (0,000-0,015)
	No	14,3	49,4	29,2	4,2	1,8	1,2	

tus, where there was a predominance of stage 2 followed by 3a in overweight and obese patients, no evidence was found in our study that related nutritional status to renal disease ($p > 0.05$).

The distribution of older adults according to the personal pathological antecedents showed that CKD was more prevalent in stages 2 and 3a, both for patients with a history of arterial hypertension and for those who did not have this condition. However, for stages 3b, 4 and 5 the percentages of kidney disease predominated in hypertensive patients

(7.5%; 7.5%; 5.7%) respectively, there was no significant association ($p > 0.05$) in our study.

Regarding the antecedent of diabetes mellitus, similar results were observed, reaching the highest percentages of chronic kidney disease in patients with a previous diagnosis of diabetes mellitus in the more advanced stages, 3b (11.4%), 4 (11.4 %) and 5 (5.7%). The test of statistical significance performed yielded a strong association ($p = 0.000$) between the antecedent of diabetes mellitus and kidney disease.

When analyzing the distribution of risk factors present in patients exposed and not exposed to CKD (Table 4), we can see that all risk factors were related to the presence of kidney disease with a relative risk ($RR > 1$), observing that only the marital status and the presence of obstructive nephropathy presented a relative risk less than one ($RR < 1$).

Table 5 shows the stratification of the risk of CKD according to the simplified classification proposed by the KDIGO 2012 Guidelines²⁰ where the highest percentage of participants presented a low risk of

kidney disease (50.7%), while 9.5 % presented a very high risk for the disease.

Discussion

Chronic kidney disease is an important public health problem in the world due to the associated comorbidity and the high cost of renal replacement treatments when end-stage renal failure occurs. In addition, it constitutes a powerful risk factor for vascular disease and mortality.

Table 4. Risk factors for chronic kidney disease and relative risk.

Risk factors for chronic kidney disease	Exposed patients	Exposed patients	Relative risk	Relative risk
Age (over 80 years)	9	12	1,15	0,38-3,44
Sex (female)	36	50	1,19	0,79-1,79
Marital status (singles and/widowers)	34	57	0,99	0,89-1,10
Occupation (unemployed)	37	56	1,09	0,64-1,74
Arterial hypertension	32	53	1,04	0,52-2,09
Diabetes mellitus	18	21	1,26	0,74-2,15
Malnutrition by excess	51	83	1,17	0,64-2,14
Obstructive nephropathy	3	12	0,54	0,16-1,79
Anemia	4	1	2,17	0,79-5,97
Proteinuria	29	22	1,8	1,23-2,63

Table 5. Risk stratification of chronic kidney disease according to glomerular filtration and albuminuria. El Alto, Bolivia. September-December, 2018.

Stages of CKD	GF value (ml/min/1.73 m ²)	Albuminuria			Risk assessment	
		< 30 mg/g	30 - 299 mg/g	= 300 mg/g	Classification	< 30 mg/g
1	= 90	12,3	3,4	2	Bajo	50,7
2	60 - 89	38,4	4,4	1,5		
3	45 - 59	19,2	5,4	2,5	Moderado	27
3	30 - 44	3,9	1	0,5	Alto	12,8
4	15 - 29	0,5	1	2	Muy alto	9,5
5	= 15	0	0,5	1,5		

The prevalence and incidence of CKD have increased in recent years worldwide, in part, due to the increased prevalence of diseases such as diabetes, hypertension and obesity in the general population, where the odds increase with age.^{20,21} It is estimated that 10% of the general population is at risk of developing this disease at some time in their life, although up to three quarters of those affected are not aware of suffering this gradual loss of function of their kidneys.^{22,23}

In the city of El Alto, department of La Paz, in Bolivia, it was observed that patients older than 60 years who attended the outpatient clinic of nephrology at the CISC Chacaltaya presented a certain degree of decreased renal function, where the higher percentages were found in stages 2 and 3a of the staging proposed by the K/DOQI 2002¹ and KDIGO 2012²¹ Guidelines.

The results of this series are consistent with those reported by Candelaria-Brito, et al.,¹⁷ Martínez-Pérez, et al.,²⁴ Terazón-Miclín, et al.,²⁵ and Calvo-Vázquez et al.,²⁶ by identifying that the predominant stage of CKD is stage 2.

Contrary to what was found in the present investigation, the framework document on CKD within the strategy for the approach of chronicity of the Spanish National Health System²⁷ finds a higher prevalence in stages 3b, 4 and 5 of this pathology. On the other hand, in Cuba, Regueira-Betancourt, et al.,²⁸ found results that surpassed the present series in stages 3a, 3b and 4, but coincided in stages 1 and 2. Other studies found a higher prevalence in stage 1.²⁹

Many international studies observe a clear trend to increase the risk of CKD with age,^{30,31} showing an increase in the prevalence of the disease as the age of the patients increases,¹ mostly from the age of 70 years in all populations, given by a higher prevalence of noncommunicable chronic diseases, especially pathologies of cardiovascular etiology.

In the present study, the highest percentages of kidney disease were identified in the age group of 70 to 79 years, followed by the group of 60 to 69 years, with a clear predominance of those in stages 2 and 3a.

These results are similar to those reported in the international literature, where it is mentioned that in people over 60 years the risk of CKD is two to three-fold higher than in people under this age.³²

In a study conducted in the city of Camagüey, Cuba, a higher prevalence of patients with kidney disease was found in the age group of 61 to 70 years,³³ similar results were reported by Gutiérrez-Rufín, et al.,³⁴ Other studies conducted in Asturias, Spain,³⁵ and in Chile,³⁶ reported high prevalence rates in this population group.

Meanwhile, Albuquerque, et al.,³⁷ refer that age is directly correlated with the risk and staging of CKD, which indicates that the length of the disease of the patients is related to the risk of suffering from it.

As for sex, in the frequency observed there were more men than women, however, a predominance of kidney disease was observed in women over men with a higher percentage in stages 2 and 3a; although it showed no statistical significance.

These results coincide with other investigations,^{34,35,38} where a slight predominance of kidney disease in women in relation to men is reported. Unlike what was reported by Sosa Barberena³⁹ and Silveira³³ where men predominate, similar results were found by Candelaria-Brito, et al.¹⁷

Pérez-Oliva, et al.,⁴⁰ stated an association between the prevalence of CKD and the gender, usually with a higher prevalence in women, and reported that stage 3b was more prevalent in women, which does not coincide with this study sample.

The gender is a condition to be taken into account when assessing the presence of chronic kidney disease in the elderly.⁴¹

Other sociodemographic risk factors such as the marital status and occupation of the patient, which lead to low economic income and a worse quality of life, constitute factors of susceptibility to suffer from a chronic kidney disease.^{20,21}

In our study it was possible to identify, regarding the marital status, that single and widowed patients had

the highest percentages of kidney disease, although this relationship was not sufficiently evident to say that there is a statistical association between this condition and the onset of CKD, but it is clear that it is a condition to take into account due to the loss of the family relationship, and the abandonment of many appropriate social and dietary habits. On the other hand, the occupation is an important condition for personal and family sustenance. In our series, we can observe how in the more advanced stages of renal disease 3b, 4, 5, the unemployed patients predominate versus those with an established employment.

In the case of patients with CKD, family studies are scarce, so there are very few bibliographic references on the impact on the health status of these patients and viceversa.⁴² In this aspect, the authors agree with Domínguez-Ardila, et al.,⁴³ that an important condition is the assessment of the family environment, the support networks and the external resources of the patient, that may play a relevant role in the process of attention and care of the geriatric patient. The family support takes various forms, ranging from direct monetary support to the personal care of a sick relative, going through the emotional support of the family members.¹⁷

On the other hand, the coverage of retirement and pension systems in Latin America is very low and with significant differences according to the area of residence. Less than half of the urban population aged 60 and over is a beneficiary of social security, compared to one third in rural areas.¹⁷ In many Latin American countries, retirement coverage serves less than a quarter of the elderly population.⁴⁴

In Bolivia, the economic constraint has been the main barrier to the management of these patients, however, the modification of Law 475 and the promulgation of Supreme Decree 1870 have allowed that, as of 2014, more than 2000 patients receive hemodialysis for free and that kidney transplant surgeries increase by 40%,^{18,19} although the coverage for early diagnosis and patient follow-up is still insufficient.

There are other classic risk factors described that contribute to the decrease of renal function, such as

metabolic syndrome, smoking, dyslipidemia, sedentary lifestyle and the one that interests us right now, obesity. Obese people have a greater predisposition to glomerulomegaly and focal segmental glomerulosclerosis, it has also been observed that obesity is associated with a higher rate of loss of renal function. Increased BMI is a risk factor for the development of kidney disease.⁴⁵

The results regarding the distribution of patients according to the stage of renal disease and nutritional status in our series show that patients with normal weight have the highest percentages of renal disease in stage 2, however, these percentages increase in the stages 3a, 3b and 4 in patients who classify as overweight or obese, showing an increased risk of suffering from kidney disease in relation to patients who classify as normal weight, with a relative risk greater than one (RR = 1.17).

These results agree with what was found in the international literature where it is reported that increased BMI is a risk factor for the development of kidney disease (OR: 1.23, 95% CI, 1.08-1.41) with a RR of 1.87 in overweight or obese individuals.^{18,20,21}

What has been reported by Castillo Parodi, et al.,⁴⁶ agrees with the results of this series, highlighting that a high percentage of patients with different stages of CKD have a diagnosis of overweight or obesity according to the BMI.

Other studies^{47,48} report that overweight and obesity in older adults modestly increase the risk of CKD and the associations are mainly caused by confounding effects of arterial hypertension and diabetes mellitus, contrasting with what It occurs in adolescence and young adulthood, where obesity conditions a prolonged exposure to different comorbidities that increase the risk of chronic kidney disease. This prolonged effect of obesity, together with other independent factors, acts on different functional renal parameters that determine the development and progression of kidney disease in obese individuals.

Diabetes mellitus and arterial hypertension constitute the first two causes that most affect the

development of CKD, being diabetic nephropathy (renal complication of diabetes) the first, followed by hypertensive nephropathy (renal complication of hypertension) the second in the world. This was demonstrated in the analysis of the risk factors of the Framingham Heart Study.^{21,49}

The percentages of arterial hypertension and diabetes mellitus identified in our series are comparable with those reported by the Bolivian dialysis and transplant registry.¹⁹ In our study we can observe that hypertensive patients predominate in the most advanced stages of kidney disease, while in stages 2 and 3a non-hypertensive patients predominate, similar results are observed in patients with a history of diabetes mellitus, the latter showing a strong statistical association ($p = 0.000$) with the development of kidney disease.

These results are consistent with those reported by other authors,⁵⁰ where they refer that in the pre-dialysis stages, renal disease caused by arterial hypertension is more prevalent than that caused by diabetes mellitus, however, more patients are admitted to renal replacement therapy due to diabetes than to high blood pressure.

Finally, in our casuistry, the individuals treated in outpatient nephrology consultation show a low risk of suffering from kidney disease. On the other hand, the identification of risk factors in this older adult population allow us to adopt more adequate prevention and control measures to prevent the progression of kidney disease to more advanced stages.

Conclusions

Chronic kidney disease has a high prevalence in the population over 60 years of age treated in the nephrology outpatient clinic. This prevalence is higher in women than in men and increases with age, being anemia, proteinuria and diabetes mellitus the main risk factors present. Early detection of this

disease is important to improve control of risk factors with the intention of preventing progression to end-stage renal failure. The follow-up of this cohort of older adults will provide more data on the evolution of CKD in our environment.

Conflict of interest

The authors declare that there is no conflict of interest.

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Ethical responsibilities

Protection of people and animals

The authors declare that no experiments were performed on human beings or animals for this research.

Data confidentiality

The authors declare that they have followed the protocols of their workplace on the publication of patient data.

Right to privacy and informed consent

The authors declare that patient data do not appear in this article.

Contribution of the authors

José Antonio Chipi Cabrera: main author, data processing.

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