Prevalence of chronic kidney disease in a city of southeast Brazil

Prevalência da doença renal crônica em um município do sudeste do Brasil

Authors

Lucas Ferreira Alves [1]

Thalles Trindade de Abreu [2]

Núbia Chouchounova Silva Neves [2]

Flávio Augusto de Morais [3]

Isabela Lourdes Rosiany [2]

Wander Valadares de Oliveira Júnior [2]

Sérgio Wyton Lima Pinto [4]

Alba Otoni [2]

[1] Universidade Federal de Minas Gerais.
[2] Universidade Federal de São João Del-Rei.
[3] Secretaria Municipal de Saúde de Divinópolis.
[4] Hospital São João de Deus.

ABSTRACT

Introduction: Chronic kidney disease (CKD) is a worldwide public health alarming problem. **Objective:** This study investigated the estimated prevalence of kidney disease in diabetic and high-risk hypertensive patients to cardiovascular disease registered in Hiperdia program of a city of southeast of Brazil. **Methods:** It is a transversal study conducted between May 2014 and August 2015. The study has included randomly 243 diabetic and high-risk hypertensive patients to cardiovascular disease which were originally referred from primary health care to the Hiperdia. CKD was classified based on cause, Glomerular Filtration Rate (GFR), and albumin creatinine ratio (ACR). Were considered abnormalities GFR < 60 mL/min/1.73m² and/or ACR ≥ 30 mg/g. **Results:** Of the 243 patients, 89 (36.6%) showed alterations in renal function markers in the first collection. Of these, 60 patients had a GFR < 60 mL/min/1.73 m² and 25 the GFR was < 45 mL/min/1.73 m². The ACR was ≥ 30 mg/g in 43 patients and eight of the values were > 1000 mg/g. In 15 patients studied were found both changes. Of the 89 participants with abnormal renal function markers in the first collection 63 held the second test and 42 kept the changes being diagnosed with CKD. None of these patients had prior knowledge of the diagnosis of kidney disease and the need for consultation with the nephrologist. **Conclusion:** The prevalence of CKD was 17.3% of disease in the population studied.

Keywords: albuminuria; glomerular filtration rate; prevalence; renal insufficiency, chronic.

RESUMO

Introdução: A doença renal crônica (DRC) é um impactante problema de Saúde Pública nos dias atuais no Brasil e no mundo. **Objetivo:** Investigar a prevalência estimada de doença renal crônica em pacientes diabéticos e hipertensos de alto risco cardiovascular cadastrados no Hiperdia em um município do sudeste do Brasil. **Métodos:** Estudo transversal realizado entre maio de 2014 e agosto de 2015. Incluídos de forma aleatória 243 pacientes com diabetes e/ou hipertensão de alto risco cardiovascular que foram referenciados da atenção básica em saúde para o Hiperdia. A DRC foi classificada com base na causa, na categoria da taxa de filtração glomerular (TFG) e razão albumina/creatinina (RAC). Foram consideradas anormalidades TFG < 60 mL/min/1,73m² e/ou RAC ≥ 30 mg/g. Os dados foram coletados em dois momentos: no início do estudo e seis meses após a primeira coleta. **Resultados:** Dos 243 pacientes, 89 (36,6%) apresentaram alteração nos marcadores de função renal na primeira coleta. Destes, 60 pacientes apresentaram TFG < 60 mL/min/1,73 m² e em 25 a TFG foi < 45 mL/min/1,73 m². A RAC foi ≥ 30 mg/g em 43 pacientes e, em oito destes, os valores foram > 1000 mg/g. Em 15 pacientes foram encontradas ambas as alterações estudadas. Dos 89 participantes com alteração dos marcadores de função renal na primeira coleta, 63 realizaram a segunda coleta e 42 mantiveram as alterações, sendo diagnosticados com DRC. Nenhum desses pacientes tinha o conhecimento prévio desse diagnóstico e da necessidade da consulta com o nefrologista. **Conclusão:** A prevalência de DRC foi de 17,3% da doença na população estudada.

Palavras-chave: albuminúria; insuficiência renal crônica; prevalência; taxa de filtração glomerular.

INTRODUCTION

Chronic kidney disease (CKD) is considered a major public health problem worldwide, causing a huge negative impact on the quality of life of patients, demanding a significant part of the resources allocated to healthcare.[1] Today, CKD is defined by the Kidney Disease Improvement Global Outcomes (KDIGO)[2] guidelines as functional or structural abnormalities of the kidneys, present for more than three months, with impacts on patient's health.

It is recommended that renal impairment should be assessed by measuring albuminuria, mainly by the urinary albumin/creatinine ratio (ACR), and renal function assessment by estimating the glomerular filtration rate (GFR), using serum creatinine values in one of several available equations.[2]

In Brazil, there is little data on non-dialytic CKD; however, a laboratory data analysis of Brazilian adults from all regions, revealed that 2.3% of the randomized samples had GFR < 45 mL/min/1.73 m^2, which would represent an estimated 2.9 million Brazilians with moderate to severely impaired renal function (stage 3b).[3] Data from the Longitudinal Health Study of Adults (ELSA-BRAZIL) demonstrated a prevalence of 9.9% of reduced GFR (< 60 mL/min/1.73 m²) in Brazilian adults with diabetes.[4] As for patients in renal replacement therapies, it is estimated that they represent around 112,000 Brazilians.[5]

According to the Brazilian Dialysis Census (2014), the main underlying diagnoses of dialysis patients are hypertension and *diabetes mellitus*.[5] Thus, screening patients with hypertension and diabetes enables early diagnosis of CKD, particularly in the early stages, when the disease is asymptomatic and enables the implementation of interventions that decrease the rates of progression and complication of the disease.[6,7]

In Brazil, the Hiperdia program was created by the Department of Health to provide care management by linking hypertensive and diabetic patients to the basic unit or health team through a registry. This is a computerized system that promotes continuous registration and follow up of the clinical quality and control of these diseases

and their risk factors in the population of patients with arterial hypertension and/or *diabetes mellitus*, screened and linked to health units or Basic Care SUS teams. In addition, it generates information for healthcare professionals and managers of public municipal, state and federal departments of healthcare.[8]

Considering the epidemic form with which CKD has been seen in the general population and the scarcity of studies on the prevalence of this disease, this study aimed to investigate the prevalence of CKD in diabetic and hypertensive patients at high risk for cardiovascular diseases enrolled in the Hiperdia program of a medium-size city in the state of Minas Gerais.

METHODS

ETHICAL ASPECTS

This study was previously approved by the Research Ethics Committee of the Federal University of São João Del-Rei (protocol no. 716752). All the patients signed the Informed Consent Form (TCLE).

STUDY DESIGN AND POPULATION

This was a cross-sectional observational study, carried out from March 2014 to August 2015. The patients were selected from the Primary Health Care Units of the urban area of a medium-sized municipality in Minas Gerais, comprising 24 in total. Today, there are about 13,000 patients enrolled in the Hiperdia program, among diabetics and hypertensives. Of these, 3,064 were classified as hypertensive at high risk for cardiovascular diseases, according to the protocol of the State Department of Minas Gerais, Hiperdia program: Risk Stratification (2012) and 560 as diabetics, totaling 3,624 patients.

This number was considered for the sample calculation, as well as the prevalence of 9.9% of reduced GFR (< 60 mL/min/1.73 m²) in Brazilian adults with diabetes, participants of the ELSA-Brazil baseline[4] and a confidence level of 99%, being therefore an estimated number of 224 patients.

Considering a loss of 10%, samples were collected from 243 patients from 24 healthcare units.

For the classification of cardiovascular risk, the SES/MG uses the Framingham score, adopted by the Brazilian Society of Cardiology. This score is based on positive and negative numerical values, starting from zero, according to the risk attributable to the values of age, blood pressure, total cholesterol, HDL, smoking and diabetes.

Each score obtained corresponds to a percentage of the likelihood of occurrence of a cardiovascular event in 10 years: coronary death, myocardial infarction, coronary insufficiency, angina, ischemic and hemorrhagic stroke, transient ischemic attack, peripheral arterial disease and heart failure in people from 30 to 74 years of age without cardiovascular disease at baseline. Thus, low risk individuals would have a probability less than 10% (score < 3 - 10); Between 10% and 20% (score 11-14) and high risk, equal to or greater than 20% (score > 14).[9]

The value is registered in SISHIPERDIA (Primary Care Hypertension and *Diabetes Mellitus* Clinical Management System) and associated with other risk factors such as obesity (body mass index - BMI over 30 kg/m²), use of alcoholic beverages (yes or no), dyslipidemia (triglycerides above 150 mg/dL, LDL-cholesterol greater than 100 mg/dL and HDL-cholesterol less than 40 mg/dL) and sedentary lifestyle (yes or no). These patients are classified as low risk, moderate risk and high risk for cardiovascular diseases.[9]

DATA HARVESTING

The patients were randomly selected from the Hiperdia program in Divinópolis/MG, by electronic lottery, among patients with hypertension of high risk for cardiovascular disease and diabetes. The draw was based on the proportion of patients enrolled in each Unit. Those selected were then contacted and invited to participate in the study. The exclusion criteria were: patients with acute diseases, autoimmune diseases, neoplasms, HIV seropositive, pregnancy, unable to sign the TCLE and those enrolled in a rural healthcare unit.

Patients who presented alterations in renal impairment markers upon the first collection were invited to participate in a further collection, six months after the first one, to assess the presence of CKD by the persistent alteration of renal impairment markers (GFR < 60 mL/min/1.73 m² and/or RAC > 30 mg/g). During the collections, a sociodemographic questionnaire with additional information was applied and samples of blood and first morning urine were collected.

BIOLOGICAL SAMPLES

Samples of 10 mL of venous blood were collected in the antecubital region in serum and EDTA tubes from the Vacutainer system (Becton Dickinson), after a 10-12h fasting period. In addition, a sample of the first morning urine was also collected in a sterile bottle. The first collection occurred from August to November 2014 and included 243 patients with diabetes and hypertension of high cardiovascular risk. The second collection was performed between February and April of 2015 and the 89 patients who presented some indication of renal impairment in the parameters evaluated at the first collection (GFR <60 ml/min/1.73 m² and/or RAC > 30 mg/g) were invited to participate. However, for several reasons, it was not possible to collect samples from 26 patients, then the total was 63 patients. Blood samples were centrifuged at 3500 rpm, at room temperature, for 15 minutes in a CentriBio® centrifuge, to obtain serum and plasma. These were aliquoted into Eppendorf® tubes and stored at -80°C along with urine aliquots until serum creatinine, urinary creatinine and albuminuria dosages would be performed.

LABORATORY TESTS

Serum and urinary creatinine dosages were determined by colorimetric kinetic test, using the Bioclin® K067 Kit (Belo Horizonte/MG - Brazil). The GFR was estimated by the CKD-EPI equation; formula: GFR = 141 x min (Scr/κ,1) α x max (Scr/κ,1)-1.209 x 0.993age x 1.018 [if female] x

1.159 [if black], whereas Scr is the serum creatinine value (mg/dL); k is 0.07 for women and 0.9 for men; α is -0.329 for women and -0.411 for men; min indicates the minimum of Scr/κ or 1, and max indicates the maximum of Scr/κ or 1.[10] Albuminuria was measured by the turbidimetric method, the Bioclin® K078 kit (Belo Horizonte/MG - Brazil).

STATISTICAL ANALYSIS

Statistical analyzes were performed using the SPSS 21.0 for Windows software (SPSS Incorporated, Chicago, Illinois, United States of America, 2006).

We carried out a descriptive analysis of the sociodemographic, clinical and laboratory variables used in the study.[9-16] Frequency distribution tables were used for the categorical variables, and for the continuous variables we used measures of central tendency and variability. The data was expressed as median (interquartile range). We tested the normal distribution of the variables using the Kolmogorov-Smirnov normality test. The results that presented normal distribution were compared by analysis of variance, followed by Student Newman-Keuls test. Non-parametric data was compared using Kruskal-Wallis, followed by the Dunn test. The comparison between two groups was made using the non-parametric Mann-Whitney method for the non-normal distribution variables. The correlation between some parameters studied was investigated by the Spearman test. The differences were considered statistically significant when $p < 0.05$.

RESULTS

The database comprised records from 243 patients. These were divided into groups according to the underlying disease: DM (*diabetes mellitus*), SAH (Systemic Arterial Hypertension) and SAH/DM (both diseases). The sociodemographic and clinical characteristics of the three groups and the total of 243 patients are depicted on Table 1. The laboratory parameters of the three groups according to the underlying disease of the 243 patients of the first collection are presented in Table 2.

The prevalence of evidence of renal impairment was estimated in 36.6%, considering all patients who presented some type of alteration in the markers used to evaluate renal injury. The laboratory parameters of the three groups, according to the underlying disease of the 63 patients included in the second collection are shown in Table 2.

Patients were also classified according to GFR and ACR for the risk categories proposed by KDIGO 2013[2] in groups G1 to G5, and results from the albumin/creatinine ratio between A1 and A3, respectively (Table 3). The prognosis of patients diagnosed with CKD is set forth in Chart 1.

According to the results found in the first and second collections and the definition of CKD according to KDIGO 2013,[2] the prevalence of CKD in the patients of our study was 17.3%.

DISCUSSION

The results showed a 17.3% prevalence of CKD in hypertensive patients at high risk for cardiovascular disease and/or diabetes, enrolled in the Hiperdia program of a city in the interior of Minas Gerais.

The prevalence found contributes to illustrate the local reality in a country where very little is known about the impact of early diagnosis of renal disease on its evolution. Studies in this field are still scarce, and many of the indirectly estimated prevalence are derived from cases of relatives of patients with CKD and individuals belonging to the traditional risk groups for cardiovascular diseases.[17,18]

We found that, in the 243 patients included in the first collection and in the 63 patients with signs of renal impairment, and in the 42 patients diagnosed with CKD, the prevalent group was composed of patients with SAH. A 16% prevalence of CKD was found in patients with SAH without the patients having previous knowledge of this diagnosis. In Brazil (2009), the highest prevalence of CKD was found in risk groups that had hypertension, and secondly, in DM patients.[19] These results differ from other studies published in some countries, where the main risk group For CKD is composed of patients with DM.[2,20,21]

TABLE 1 PATIENTS` SOCIODEMOGRAPHIC AND CLINICAL CHARACTERISTICS - FIRST COLLECTION

Characteristics	DM (n = 49)	SAH (n = 144)	DM/SAH (n = 50)	Total (n = 243)
Age (years)	61.0 (54.5-70.0)	62.5 (54.2-71.7)	59.5 (52.0-68.2)	61.0 (54.0-70.0)
Gender				
Male (%)	17 (34.7%)	54 (37.5%)	21 (42.0%)	93 (38.3%)
Female (%)	32 (65.3%)	90 (62.5%)	28 (56.0%)	150 (61.7%)
BMI (kg/m²)	26.3 (23.4-29.1)	27.6 (24.2-30.5)	27.8 (24.2-31.4)	27.3 (24.2-30.1)
Blood pressure				
Systolic pressure (mmHg)	120 (110-136)	130 (120-140)	125 (114.5-140.0)	130.0 (112.0-114.00)
Diastolic pressure (mmHg)	80.0 (70.0-90.0)	80.0 (70.0-90.0)	80.0 (76.0-90.0)	80.0 (70.0-90.0)
Smoking (%)	3 (5.9%)	11 (7.5%)	2 (3.5%)	16 (6.6%)
Use of alcoholic beverages (%)	10 (21.0%)	35 (24.4%)	3 (5.7%)	48 (19.8%)
Sedentarism (%)	33 (67.6%)	83 (57.5%)	38 (76.4%)	154 (63.4%)
Use of medication (%)				
β-blockers	0	28 (14.0%)	6 (12.4%)	34 (14.0%)
Calcium Channel Antagonists	0	53 (27.6%)	2 (2.9%)	55 (22.6%)
ARA	0	6 (4.3%)	0	6 (4.3%)
ACEi	0	0	28 (56.5%)	162 (67.0%)
Diuretics	0	152 (78.4%)	40 (69.8)	192 (78.0%)
Acetylsalicylic acid	0	4 (2.6%)	2 (1.9%)	6 (2.5%)
Statin	5 (4.9%)	8 (5.6%)	4 (4.2%)	17 (7.0%)
Insulin	4 (3.8%)	0	3 (2.7%)	7 (2.9%)
Secretagogues	37	0	33 (65.8%)	70 (28.8%)
Glitazones	(75.5%)	0	39 (78.1%)	63 (25.9%)
	24 (48.9%)			
Calcium Carbonate	2 (4.5%)	2 (1.4%)	1 (2.0%)	5 (2.1%)

Median; (Interquartile Interval); BMI: body mass index; CKD: chronic kidney disease; ARA: angiotensin receptor antagonists; ACEi: angiotensin converting enzyme inhibitors; DM: *diabetes mellitus*; SAH: systemic arterial hypertension.

TABLE 2 PATIENTS' LABORATORY PARAMETERS ACCORDING TO UNDERLYING DISEASE

First collection	DM (n = 49)	SAH (n = 144)	DM/SAH (n = 50)	Total (n = 243)
GFR ml/min/1.73m²	84.9 (58.0-102.0)	81.4 (58.5-107.6)	83.2 (63.2-110.7)	83.2 (60.0-104.0)
ACR mg/g	4.7 (1.2-48.2)	3.0 (0.9-12.0)	1.5 (0.5-7.9)	3.0 (0.7-13.3)
Second collection	DM (n = 16)	SAH (n = 36)	DM/SAH (n = 11)	Total (n = 63)
GFR ml/min/1.73m²	67.4 (44.8-94.0)	82.7 (51.1-101.7)	78.7 (43.8-94.5)	78.7 (51.0-94.6)
ACR mg/g	62.8 (4.8-2001.0)	9.0 (2.5-69.1)	58.2 (3.0-896.0)	22.4 (3.0-200.0)
Patients with CKD	DM (n = 11)	SAH (n = 22)	DM/SAH (n = 9)	Total (n = 42)
GFR ml/min/1.73m²	58.0 (35.3-74.1)	56.6 (43.0-92.2)	77.3 (43.5-79.5)	60.8 (43.4 -80.7)
ACR mg/g	146.4 (61.0-3896.7)	51.8 (2.8-327.0)	95.0 (15.0-901.1)	68.3 (19.0-817.4)

Median; (Interquartile Interval); BMI: body mass index; CKD: chronic kidney disease; ARA: angiotensin receptor antagonists; ACEi: angiotensin converting enzyme inhibitors; DM: *diabetes mellitus*; SAH: systemic arterial hypertension.

TABLE 3	CLASSIFICATION OF THE 42 PATIENTS DIAGNOSED WITH CKD ACCORDING TO GFR AND ACR		
GFR classification		**N**	**%**
G1 (Normal or high)		8	19.0
G2 (Slightly reduced)		13	31.0
G3a (slightly to moderately reduced)		9	21.4
G3b (Moderately to severely reduced)		6	14.3
G4 (Severely reduced)		4	9.5
G5 (Kidney disease)		2	4.8
ACR classification		**N**	**%**
A1 (Normal to slightly increased)		12	28.6
A2 (Moderately increased)		16	38.1
A3 (Severely increased)		14	33.3
Total		42	100.0

CKD: chronic kidney disease; GFR: glomerular filtration rate; ACR: albumin/creatinine ratio; G1: Group1; G2: Group 2; G3a: Group G3a; G3b: Group 3b; G4: Group 4; G5: Group 5; A1: Albuminuria1; A2: Albuminuria2; A3: Albuminuria3.

Patients with a recent diagnosis of DM or known to be diabetics present a 71% and 93% likelihood of developing CKD, respectively, when compared to normoglycemic individuals.[6] According to SIS Hiperdia data, among 1.6 million cases of DM, 7.8 % of them develop CKD.[6] In our findings there was a greater number than that reported in the literature, 20.2% of patients with DM were diagnosed with CKD. It is necessary to consider that in the study carried out by Alves Júnior & Bastos,[6] they assessed registered and monitored data from the SIS Hiperdia, whereas in the present study the data was obtained from scheduled collections with the patients, as well as the dosages and estimates of the markers, which were carried out by the researchers themselves, making it very clear the design difference of the studies.

However, considering that the patients diagnosed with CKD were not aware of this diagnosis and of their complications, it is possible to question whether, in the studied municipality, there is a limitation of chronic patients monitored by the healthcare teams.

The use of serum creatinine alone as an early marker of renal injury has long been unadvised, although it is necessary to calculate the GFR.[19,22] Bastos et al.[19] demonstrated in their study that even

with serum creatinine considered normal, 15.6% of the individuals were already in the G3 stage of CKD. Our results corroborate these findings, since the median serum creatinine was within the physiological reference values of 0.9 and 1.0 for the first and second collections, respectively, when we had already detected important changes in GFR and in the ACR in many of these patients.

Many cases of CKD are not clinically detected due to subtle and nonspecific symptoms, leading to insufficient results and tests.[22,23] In Brazil, data from the State Department of Health of Minas Gerais reports an estimated 13.9% of adults (aged 20 years or older) with CKD in one of its stages.[10]

Regarding the CKD stage classification, the prevalence of CKD patients in stages G3 and G4 in our study was 35.7% and 9.5%, respectively. In a study carried out by Silva & Brune,[24] in a Family Healthcare Unit in the city of Araguaia, in which adult patients were cared for, 46% of the patients were in the G3 stage of CKD and 2% of the patients presented in the G4 stage.

Another study, performed by Fernandes et al.,[25] also in adults with no confirmed CKD, showed that the prevalence of patients with GFR < 45mL/min/1.73m^2 - stage G3 CKD, was 2.3%. Although these studies show a different population than the one studied by us, they reinforce that the number of people who already have levels of renal function impairment is still high, but without proper knowledge about this diagnosis and, therefore, probably not performing the necessary measurements of renal function.

In a population-based cross-sectional study in the elderly, carried out in Brazil by Dutra et al.,[26] the renal function was assessed by GFR estimated by the CKD-EPI formula. They found that the large majority of the participants presented some renal impairment without previous diagnosis, even if considered discreet, and 13.6% had moderate or high renal dysfunction.

This finding was similar to our results, because in our CKD patients, whose median age classified the majority of them as elderly, a decline in GFR was also found, with a median of 60.8 ml/min/1.73 m², when compared to the GFR of the initial 243

CHART 1 CKD PROGNOSIS BY CATEGORY OF ALBUMINURIA AND GFR IN CKD PATIENTS

CKD progression prognosis				Categories for persistent albuminuria - Description and Stage		
				A1	A2	A3
				Normal to slightly increased	Moderately increased	Severely increased
				< 30 mg/g < 3 mg/mmol	30-300 mg/g 3-30 mg/mmol	> 300 mg/g > 30 mg/mmol
Categories TFG (ml/min/1,73m²)	G1	Normal or high	≥ 90		n = 3 (7.1%) Monitor	n = 5 (11.9%) Referral
	G2	Slightly reduced	60 - 89		n = 7 (16.7%) Monitor	n = 6 (14.2%) Referral
	G3 a	Slightly to moderately reduced	45 - 59	n = 5 (11.9%) Monitor	n = 2 (4.8%) Monitor	n = 2 (4.8%) Referral
	G3 b	Moderately to severely reduced	30 - 44	n = 3 (7.1%) Monitor	n = 3 (7.1%) Monitor	Referral
	G4	Severely reduced	15 - 29	n = 2 (4.8%) Referral	n = 1 (2.4%) Referral	n = 1 (2.4%) Referral
	G5	Kidney disease	< 15	n = 2 (4.8%) Referral	Referral	Referral

CKD prognosis by GFR and albuminuria category. White: low risk (if there are no other markers of kidney disease, it is not CKD); light gray: moderately increased risk; gray: high risk; dark gray: very high risk. CKD: chronic kidney disease; GFR: glomerular filtration rate (Adapted from KDIGO, 2013).[2]

patients, with a median of 83.2 mL/min/1.73 m². This finding is worrisome because, although there is a consensus in the literature that over the years there is a natural drop in GFR,[27] we still do not have in Brazil an effective governmental investment focused on the early identification of renal disease in the at-risk population, or even in the general population.

Regarding albuminuria values, as already described, some authors have demonstrated the relevance of the use of urinary ACR as a screening method for albuminuria.[2,28] In a study involving 262 individuals, 23 patients with DM and the rest healthy, all cared for by Family Health Strategy of the Eastern District of Goiânia, renal function was evaluated, and it was shown that 34.8% of patients with diabetes had an increased urinary ACR.[29] In our findings, 40.8% of patients with DM also had ACR increased. These data indicate that in diabetic patients, there is an imminent possibility of increased ACR levels and, therefore, these levels should be investigated to enable an earlier diagnosis of CKD.

Although the renal function markers cited so far (estimated GFR and ACR) were already classically recognized in the literature, the great novelty brought on by KDIGO[2] was the prognosis evaluation by associating the CKD-stage categories, defined by the estimated GFR, with Levels of albuminuria determined by the ACR. Considering this classification, the frequency of patients requiring monitoring or referral of the 243 initial patients, the 63 included in the second collection and the 42 patients diagnosed with CKD were, respectively, 28.8% and 7.8%; 31.8% and 34.9%, 47.6% and 52.4%.

These values show the large number of patients that should have already been monitored or referenced by the multidisciplinary team or Nephrology team. However, in the studied municipality, this monitoring seems limited,

and the aggravations related to CKD progression increase exponentially. Many of these patients, especially those with a very high risk of CKD progression, are likely to initiate short-term renal replacement therapy.

CONCLUSION

The results of this study showed a 17.3% prevalence of CKD in hypertensive patients at high risk for cardiovascular and diabetic diseases enrolled in the Hiperdia program, of a medium-sized municipality of Minas Gerais. In addition, they demonstrate a high rate of patients who would need monitoring and referral to the specialized team, and who were not even aware of the diagnosis. The fact that this study is not longitudinal limits the results to a specific time. In this sense, longitudinal epidemiological studies assessing the prevalence of CKD in the general population, and especially in at-risk groups, are important to reduce the number of patients requiring renal replacement therapy.

ACKNOWLEDGMENTS

REFERENCES

1. Crestani Filho VJ, Rodrigues RAC. Progressão da doença renal crônica: experiência ambulatorial em Santarém - Pará. J Bras Nefrol 2013;35:99-106.
2. Kidney Disease: Improving Global Outcomes (KDIGO) CKD Work Group. KDIGO 2012 Clinical Practice Guideline for the Evaluation and Management of Chronic Kidney Disease. Kidney Int 2013;3:1-150.
3. Fernandes N, Bastos RMR, Bastos MG. Diagnóstico da doença renal crônica a partir da filtração glomerular estimada: CKD-EPI ou MDRD In: Congresso Brasileiro de Nefrologia; 2010; Vitória, ES, Brasil. Anais. Vitória: Sociedade Brasileira de Nefrologia; 2010. p. 516.
4. Barreto SM, Ladeira RM, Duncan BB, Schmidt MI, Lopes AA, Benseñor IM, et al. Chronic kidney disease among adult participants of the ELSA-Brasil cohort: association with race and socioeconomic position. J Epidemiol Community Health 2016;70:380-9. DOI: http://dx.doi.org/10.1136/jech-2015-205834
5. Censo da Sociedade Brasileira de Nefrologia (SBN) 2014 [Citado 2015 Dez 17]. Disponível em: http://www.censo-sbn.org.br/inicio
6. Alves Júnior AC, Bastos MG. Estratificação de risco de indivíduos com doença renal crônica para a organização da rede de atenção; Série Técnica-Série Navegador SUS; 2013.
7. Bastos MG, Kirsztajn GM. Chronic kidney disease: importance of early diagnosis, immediate referral and structured interdisciplinary approach to improve outcomes in patients not yet on dialysis. J Bras Nefrol 2011;33:93-108. PMID: 21541469

8. Minas Gerais. Resolução SES Nº 2.606, de 7 de dezembro de 2010. Institui o Programa Hiperdia Minas e dá outras providências. Belo Horizonte: Diário Oficial de Minas Gerais; 2010.
9. Meireles AL, Alves Júnior AC, Galil AGS, Lanna CMM, Pereira FS, Reis FB, et al. Atenção à Saúde do Adulto. Linha-Guia de Hipertensão Arterial Sistêmica, Diabetes Mellitus e Doença Renal Crônica. Belo Horizonte: Secretaria do Estado de Minas Gerais; 2013.
10. Levey AS, Stevens LA, Schmid CH, Zhang YL, Castro AF 3rd, Feldman HI, et al.; CKD-EPI (Chronic Kidney Disease Epidemiology Collaboration). A new equation to estimate glomerular filtration rate. Ann Intern Med 2009;150:604-12. PMID: 19414839 DOI: http://dx.doi.org/10.7326/0003-4819-150-9-200905050-00006
11. Sociedade Brasileira de Cardiologia/Sociedade Brasileira de Hipertensão/Sociedade Brasileira de Nefrologia. VI Diretrizes Brasileiras de Hipertensão. Arq Bras Cardiol 2010;95:1-51.
12. World Health Organization (WHO). Who report on the global tobacco epidemic 2011: warning about thedangers of tobacco. Geneva: World Health Organization; 2011.
13. World Health Organization (WHO). Obesity: preventing and managing the global epidemic: report a Who Consultation on Obesity. Geneva: World Health Organization; 2000.
14. Haskell WL, Lee IM, Pate RR, Powell KE, Blair SN, Franklin BA, et al. Physical activity and public health: updated recommendation for adults from the American College of Sports Medicine and the American Heart Association. Med Sci Sports Exerc 2007;39:1423-34. DOI: http://dx.doi.org/10.1249/mss.0b013e3180616b27
15. World Health Organization (WHO). Global recommendations on physical activity for health. Geneva: World Health Organization; 2010.
16. Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Departamento de Vigilância de Doenças e Agravos não Transmissíveis e Promoção da Saúde. Vigitel Brasil 2014: vigilância de fatores de risco e proteção para doenças crônicas por inquérito telefônico/Ministério da Saúde, Secretaria de Vigilância em Saúde, Departamento de Vigilância de Doenças e Agravos não Transmissíveis e Promoção da Saúde. Brasília: Ministério da Saúde; 2015.
17. Sarnak MJ, Levey AS, Schoolwerth AC, Coresh J, Culleton B, Hamm LL, et al.; American Heart Association Councils on Kidney in Cardiovascular Disease, High Blood Pressure Research, Clinical Cardiology, and Epidemiology and Prevention. Kidney disease as a risk factor for development of cardiovascular disease: a statement from the American Heart Association Councils on Kidney in Cardiovascular Disease, High Blood Pressure Research, Clinical Cardiology, and Epidemiology and Prevention. Circulation 2003;108:2154-69. DOI: http://dx.doi.org/10.1161/01.CIR.0000095676.90936.80
18. Locatelli F, Pozzoni P, Tentori F, del Vecchio L. Epidemiology of cardiovascular risk in patients with chronic kidney disease. Nephrol Dial Transplant 2003:vii2-9. PMID: 12953023
19. Bastos MG, Carmo WB, Abrita RR, Almeida EC, Mafra D, Costa DMN, et al. Doença renal crônica: Problemas e Soluções. J Bras Nefrol 2004;26:202-15.
20. Coresh J, Selvin E, Stevens LA, Manzi J, Kusek JW, Eggers P, et al. Prevalence of chronic kidney disease in the United States. JAMA 2007;298:2038-47. PMID: 17986697 DOI: http://dx.doi.org/10.1001/jama.298.17.2038
21. Jha V, Garcia-Garcia G, Iseki K, Li Z, Naicker S, Plattner B, et al. Chronic kidney disease: global dimension and perspectives. Lancet 2013;382:260-72. PMID: 23727169 DOI: http://dx.doi.org/10.1016/S0140-6736(13)60687-X

22. Pecoits Filho R. Diagnóstico de doença renal crônica: avaliação da função renal. J Bras Nefrol 2004;26:4-5.
23. Glassock RJ, Winearls C. CKD-fiction not fact. Nephrol Dial Transplant 2008;23:2695-6. DOI: http://dx.doi.org/10.1093/ndt/gfn331
24. Silva MMH, Brune MFS. Importância do cálculo da taxa de filtração glomerular na avaliação da função renal de adultos. Rev Bras Farm 2011;92:160-5.
25. Fernandes N, Bastos RMR, Bastos MG. Diagnóstico da doença renal crônica a partir da filtração glomerular estimada: CKD-EPI ou MDRD. In: Congresso Brasileiro de Nefrologia; 2010; Vitória, ES, Brasil. Anais. Vitória: Sociedade Brasileira de Nefrologia; 2010. p. 560.
26. Dutra MC, Uliano EJ, Machado DF, Martins T, Schuelter-Trevisol F, Trevisol DJ. Assessment of kidney function in the elderly: a population-based study. J Bras Nefrol 2014;36:297-303. DOI: http://dx.doi.org/10.5935/0101-2800.20140043
27. Delanaye P, Richard A, Glassock J. Glomerular Filtration Rate and Aging: Another Longitudinal Study-A Long Time Coming! Nephron 2015;1:1-4.
28. Bottini PV, Afaz SH, Silveira S, Garlipp CR. Utilização da relação albumina/creatinia no diagóstico de microalbuminúria. J Bras Patol Med Lab 2005;41:99-103. DOI: http://dx.doi.org/10.1590/S1676-24442005000200007
29. Braga AKP, Pereira ERS, Batista SRR, Naghettini AV. Avaliação da função renal em diabéticos adultos. In: V Seminário de Extensão Universitária da Região Centro-Oeste; 2012 Jun 4-6; Goiânia, GO, Brasil.