Prevalence of chronic renal disease in adults attended by the family health strategy

Prevalência de doença renal crônica em adultos atendidos na Estratégia de Saúde da Família

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Abstract

Introduction: Chronic Kidney Disease (CKD) is an important Brazilian public health issue that has as main etiologies, arterial hypertension and *diabetes mellitus* (DM). The precocious diagnosis is important, because it allows the implementation of preventive measures that retard or interrupt the progression to the most advanced stages of the CKD. **Objective:** Identify the prevalence and the associated factors to the CKD among adults served by the Family Health Strategy (FHS). **Methods:** Cross-sectional study with epidemiological, descriptive and observational design, realized with 511 adults older than 20 years, served by the FSH in a region of Goiania. CKD was defined as GFR < 60 mL/min/1.73m^2 and/or albuminuria ≥ 30 mg/g. The GFR was estimated by the Cockcroft-Gault equation and albuminuria by the ratio of albumin and urinary creatinine in the urine sample. The independent variables were age, sex, blood pressure, alcohol comsumption, DM, smoking and overweight/obesity. **Results:** The CKD prevalence was 32,53%. While GFR < 60ml/min/1.73 m^2 occurred in 10,64% and albuminuria in 25,29% of the sample. The analysis identified a significant association between the ages ≥ 60 and GFR < 60ml/min/1.73 m^2 (p < 0,001); as the albuminuria ≥ 30 mg/g the association was found in the male gender (p = 0,043), DM (p = 0,002) and alcohol consumption (p = 0,035). **Conclusion:** There was a high prevalence of CKD's early stages on FHS, taking in consideration the risk factors of age ≥ 60 years old, masculine gender, DM and alcohol consume. Therefore, a CKD screening and monitoring is suggested in adults who are served by the FHS.

Keywords: chronic kidney disease, prevalence, primary health care, risk factors.

Resumo

Introdução: Doença renal crônica (DRC) é um importante problema de saúde pública que, no Brasil, tem como principais etiologias a hipertensão arterial (HA) e o *diabetes mellitus* (DM). O diagnóstico precoce possibilita a implementação de medidas preventivas que retardam ou mesmo interrompem a progressão para os estágios mais avançados da DRC. **Objetivo:** Identificar a prevalência e os fatores associados à DRC entre adultos atendidos pela Estratégia de Saúde da Família (ESF). **Métodos:** Estudo transversal com delineamento epidemiológico, descritivo e observacional, realizado com 511 adultos maiores de 20 anos, atendidos na ESF em região de Goiânia, GO. Definiu-se DRC como TFG < 60 mL/min/1,73 m^2 e/ou albuminúria ≥ 30 mg/g. A taxa de filtração glomerular (TFG) foi estimada pela equação de Cockcroft-Gault e a albuminúria por meio da razão entre albumina e creatinina urinária em amostra de urina. Constituíram variáveis independentes: idade, sexo, pressão arterial, uso de álcool, DM, tabagismo e sobrepeso/obesidade. **Resultados:** A prevalência de DRC foi 32,53%, enquanto TFG < 60 mL/min/1,73 m^2 ocorreu em 10,64% e albuminúria em 25,29% da amostra. A análise identificou associação significativa entre idade ≥ 60 anos e TFG < 60 mL/min/1,73 m^2 (p < 0,001). Quanto à albuminúria ≥ 30 mg/g, encontrou-se associação com sexo masculino (p = 0,043), DM (p = 0,002) e consumo de álcool (p = 0,035). **Conclusão:** Observou-se alta prevalência de DRC nos estágio iniciais na ESF, sendo os fatores associados à doença idade ≥ 60 anos, sexo masculino, DM e consumo de álcool. Logo, sugere-se a realização de triagem e monitoramento para DRC em adultos atendidos na ESF.

Palavras-chave: atenção primária à saúde; fatores de risco; insuficiência renal crônica; prevalência.

Introduction

Chronic kidney disease (CKD) is currently considered a public health problem worldwide, and the number of carriers increases globally.[1] Incidence and prevalence rates of this disease in Brazil grow at an accelerated pace. In the year 2000 the estimated number of patients in renal replacement therapy (RRT) was 42.695,[2] and in July 2012, it reached the mark of 97,586, a growth of approximately 2.3 times in 12 years, corresponding to a dialysis prevalence rate of 503 patients per million of the population.[3]

However, despite the apparent spread of the disease, Brazil lacks studies to assess the prevalence of non-dialysis patients with CKD, as it is investigated in other countries.[4-6]

In the Initiative on Nephropathy, of relevance to public health, Which is Chronic, possibly in its Initial stages, and carries a Potential risk of clinical Major Endpoints (INCIPE) study, held in the Northeast of Italy, they found a CKD prevalence of 13.2%.[4] In the study from the National Health and Nutrition Examination Survey (NHANES), carried out in the United States, the same ratio reached 20.3%,[5] a result similar to that found in the EROCAP (22.7%) study in spain.[6] In Brazil, a population-based study carried out in Bambuí, state of Minas Gerais, showed a prevalence of increased serum creatinine in adults of 0.48% to 5.09% in the population > 60 years.[7] However, as the definition for CKD adopted in the study was based on the elevation of serum creatinine, the true prevalence of CKD based on glomerular filtration rate (GFR) < 60 ml/min can be underestimated.[8,9]

In These settings, it is necessary to consider the factors associated with the development of renal damage. This analysis was studied by the US Multiple Risk Factor Intervention Trial, which found, among 300,000 male individuals, continually assessed over 16 years, loss of glomerular filtration, especially among those with advanced age, smokers, hypertensive and diabetics.[10]

In addition to these conditions, obesity has been highlighted as a factor associated with CKD, a worrisome fact because in the beginning of the twenty-first century scholars estimated 312 million obese adults in the world.[1] In addition, a high body mass index (BMI) contributes to the development of CKD in subjects without arterial hypertension (AH) or *diabetes mellitus* (DM),[11] and abdominal circumference (AC) is strongly associated with metabolic diseases and CKD.[12]

Some studies have currently investigated the effects of alcohol intake on renal function, finding different results. Yamagata *et al.*[13] reported that an intake of less than 20g per day reduce the risk of developing renal dysfunction in both genders, whereas there is a decrease in beneficial effects in cases of daily intake greater than 20g. Hsu *et al.*[14] also showed that alcohol intake is inversely and significantly associated with stage 3 CKD in Taiwanese men.

Thus, given the various factors associated with CKD, every patient with one or more of them, even if asymptomatic, should be regularly assessed through urinalysis, albuminuria, serum creatinine and GFR calculation as an approach to early diagnostic screening.[9,15]

This initial assessment in Brazil, as per recommended by the Public Healthcare System (SUS), is within the scope of the Family Health Strategy (FHS), gateway to the healthcare network and referral to specialties.[16] It is widely agreed that to diagnose and treat CKD in its early stages can help reduce the burden on the SUS, CKD and its complications, such as terminal CKD and the need for RRT.[15]

Given the above, this study contributes to survey data regarding CKD not requiring dialysis in Brazil and aims to identify the prevalence and factors associated with this disease among adults served by the FHS.

Methods

Epidemiological, cross-sectional, descriptive and observational study, aimed to assess the prevalence of CKD and associated factors in individuals over 20 years, belonging to families served by the Eastern Health District FHS, Goiania, GO.

The project was approved by the Ethics Committee in Human and Animal Research of the Federal University of Goiás (Ethics Research Committee of the Hospital of the UFG, protocol: 170/09), and all participants signed the free and informed consent Form (IC).

We evaluated 689 subjects, 511 of them were included in this study. The sample size was calculated based on the frequency of 8-16% of CKD[1], 5% margin of error, resulting in a minimum sample size of 500 individuals to a confidence level of 95% and 80% power.

The sample selection was carried out through a simple random drawing from the map of the eight units belonging to the FHS of the East Sanitary District of

Goiânia, and we decided to interview the participants in their homes. We included all individuals > 20 years, of both genders, dwellers of randomly selected households. We excluded hospitalized patients, those absent from home on two visits or those who did not agree to sign the consent form.

We collected the data from September 2011 to March 2013, using a standardized questionnaire, pre-tested in a pilot study with 10 families. This instrument enabled the collection of clinical, anthropometric and lifestyle-related data as well as the investigation of the personal and family history of previous CKD.

Clinical Evaluation

The following clinical variables were assessed: age, gender, blood pressure, alcohol use, DM, smoking, overweight/obesity.

In order to standardize the collection of anthropometric data, we used an electronic Filizola scale, platform model, with a capacity of 200 kg and precision of 100 g in weight. The individuals were weighed barefoot and wearing light clothing. For the height measurement, we used the stadiometer, accurate to 0.1 cm. Based on these measures we calculated the participants' BMI, by dividing weight by the square of height.

Their nutritional status was categorized by percentiles, established according to the WHO classification (1997) for adults without overweight, BMI < 25 kg/m^2; overweight to values between 25 and 30 kg/m^2; and obesity, for individuals with BMI ≥ 30 kg/m^2.

High blood pressure was considered when systolic blood pressure (SBP) ≥ 140 mmHg and/or diastolic blood pressure (DBP) ≥ 90 mmHg. The blood pressure was measured according to the technique standardized by the VI Brazilian Guidelines on Arterial Hypertension,[17] using semiautomatic Omron HEM-705 CP machines. We decided to carry out a measurement on each arm at the beginning of the interview and repeat it at the end, in those who had a higher value. For analysis purposes, we considered the average value of the three measurements carried out in each participant.

With regards to smoking, the individuals were classified as follows: smokers, former smokers (not smoking for more than six months) and never smoked.

Finally, we considered diabetics, those previously diagnosed subjects, in use of medication for diabetes and plasma glucose ≥ 126 in fasting and ≥ 200 in casual measurement.[18] With regards to the consumption of alcohol, the classification adopted two categories: users or nonusers.

Laboratory Evaluation

We scheduled the first urine sample collection for dosing urinary albumin and creatinine; and blood collection for dosing blood glucose and serum creatinine levels by the accredited laboratory. The biochemical measurements of albumin and creatinine were held in Konelab 30 biochemical analyzer, and albumin was evaluated by the colorimetric method (bromocresol green) and creatinine by the kinetic method.

For variable-dependent CKD criterion, we used the suggestion from the *Kidney Disease: Improving Global Outcomes* (KDIGO 2012),[9] that takes into account the presence of renal injury (albuminuria) and/or the decrease in GFR (< 60 mL/min/1.73m^2).

We used albuminuria as a marker of renal injury, and albuminuria was considered as the ratio between the concentration of urinary albumin and creatinine equal to or greater than 30 milligrams of albumin per gram of creatinine.[9] The GFR was estimated by the Cockroft- Gault equation for individuals older than 18 years, which considers the variables: serum creatinine, weight, age and gender.[19] When the calculated values were below 60 ml/min/1.73m^2,[9] the GFR was classified as reduced.

Additionally, there was a risk rating for CKD prognosis for those who had GFR and albuminuria measures. Patients were classified as of low risk, moderate risk, high risk and very high risk for developing renal and cardiovascular outcomes, such as terminal CKD, cardiovascular disease and death from cardiovascular causes, as proposed by the KDIGO 2012.[9]

Statistical analysis

For statistical analysis, we used the IBM SPSS software *(Statistical Package for Social Sciences)* version statistics 19 for Windows. The association between variables was assessed by means of chi-square tests (X^2), Fisher's exact test and odds ratio analysis (odds ratio/OR). Tested dependent variables were albuminuria and GFR and, independent variables were: age, gender, increased blood pressure, alcohol intake, DM, smoking and overweight/obesity.

The numerical variables are presented as mean (± standard deviation). The results were defined as statistically significant for a p value < 0.05 or 5% for all tests.

Results

Of the 511 adults studied, 67.71% were women, ranging in age between 20-96 years, mean of 45.2 years (± 15.9 years). The demographic and clinical characteristics are shown on Table 1.

Table 1 Demographics, clinical and laboratory characteristcs of adults seen in the family health strategy, Goiânia, 2013

Variables	
Age (years)	45.2 ± 15.9
Women n (%)	346 (67.7)
SBP (mmHg)	136.1 ± 15.6
DBP (mmHg)	82.2 ± 9.8
Arterial pressure ≥ 140/90 mmHg n (%)	154 (30.2)
Arterial pressure < 140/90 mmHg n (%)	356 (69.8)
Smoking n (%)	67 (13.1)
Alcohol intake n (%)	165 (32.3)
Diabetes n (%)	59 (11.5)
BMI (kg/m^2)	26.8 ± 5.1
BMI < 25 (kg/m^2) n (%)	199 (39.1)
BMI ≥ 25 (kg/m^2) n (%)	309 (60.9)
GFR (ml/min)	100.5 ± 34.0
GFR < 60 ml/min (%)	25 (10.6)
GFR ≥ 60 ml/min (%)	210 (89.4)
Albuminuria (mg/g)	20.8 ± 28.0
Albuminuria < 30 mg/g n (%)	192 (74.7)
Albuminuria ≥ 30 mg/g n (%)	65 (25.3)

Continuous variables as mean ± standard deviation; and categorical variables as number (percentage); SBP: Systolic blood pressure; DBP: Diastolic blood pressure; BMI: Body mass index; GFR: Glomerular filtration rate.

Serum creatinine was dosed in 235 individuals, which enabled the GFR calculation, with average value of 100.5 ml/min/1.73 m^2 (± 34.0 ml/min/1.73m^2), ranging from 20 to 203 ml/min/1.73 m^2; 25 (10.64%) had GFR < 60 mL/min/1.73 m^2. We dosed albuminuria in 257 individuals: average of 20.8 mg/g (± 28.0 mg/g) ranging from 1 to 328 mg/g, and 65 (25.29%) had values ≥ 30 mg/g. Considering the current definition of CKD as having a GFR < 60 mL/min/1.73m^2 and/or albuminuria > 30 mg/g, the prevalence of this disease reached 32.53%.

According to Table 2, age ≥ 60 years was significantly associated (p < 0.001) with GFR < 60 mL/min/1.73 m^2. As we can see on Table 3, male gender (p = 0.043), having diabetes (p = 0.002) and alcohol intake (p = 0.035) proved to be factors significantly associated with the development of albuminuria ≥ 30 mg/g.

As for CKD prognosis, considering the categories of GFR and albuminuria (Figure 1), we analyzed 220 patients who had both tests available. We noticed that 165 (75.00%) of them were at low risk; 38 (17.28%) had moderately increased risk; 9 (4.09%) had high risk and 8 (3.63%) had very high risk of developing adverse renal and cardiovascular outcomes, such as end-stage chronic kidney disease, cardiovascular disease or death from cardiovascular causes.

Discussion

In this study, the overall prevalence of CKD as defined by KDIGO 2012[15] was high (32.53%), predominantly in patients with albuminuria and normal GFR, stages 1 and 2 CKD (21.89%). The factors associated with this disease were: age ≥ 60 years, male gender, diabetes and alcohol intake, while the association with GFR < 60 ml/min/1.73 m^2 was only present among those aged > 60 years.

In this regard, global statistics show a CDK prevalence between 8-16%,[1] although the estimate of cases in the early stages of the disease presents limitations, as the studies show, most do not take into account the current classification[7,9], which includes decreased GFR and/or the presence of albuminuria.[20]

Another difficulty is the lack of research on the prevalence of CKD in primary care,[5,21-23] which culminates in underdiagnosis and undertreatment. One of the few studies available, carried out in primary care in Chile, found a prevalence of GFR < 60 ml/min/1.73 m^2 of 12.1%,[21] similar to our study, in which GFR < 60 ml/min/1.73 m^2 happened to 10.64% of the sample. As to albuminuria (> 30 mg/g) it was found to be 26.1% in the Chilean study and 25.29% in this sample. Another studied carried out in primary care centers in Spain, published in 2007, so prior to the current classification, had a higher prevalence of individuals with GFR < 60 ml/min/1.73 m^2, 21.3%[5], compared to our study. It is noteworthy that in the Spanish study, they did not evaluate albuminuria, suggesting an even higher prevalence of CKD in early stages.[5]

Table 2 Clinical variables associated with the glomerular filtration rate of adults seen in the family health strategy, Goiânia, 2013

Variables	GFR < 60 mL/min (n = 25)	GFR ≥ 60 mL/min (n = 210)	*p*	OR (IC 95%)
Age (years)				
21-59	12 (6.7%)	167 (93.3%)	0.001*	4.21 (1.79-9.88)
≥60	13 (23.21%)	43 (76.79%)		
Gender				
Male	10 (15.15%)	56 (84.85%)	1.833	(0.78-4.31)
Female	15 (8.87%)	154 (91.13%)		
BP				
Increased	6 (8.57%)	64 (91.43%)	0.503	0.72 (0.27-1.89)
Normal	19 (11.51%)	146 (88.49%)		
Alcohol intake				
Yes	6 (7.79%)	71 (92.21%)	0.707	(0.27-1.85)
No	19 (10.67%)	159 (89.33%)		
Diabetes				
Yes	4 (13.33%)	26 (86.67%)	0.720	(0.24-1.89)
No	21 (10.24%)	184 (89.76%)		
Smoking				
Yes	6 (15.39%)	33 (84.61%)	1.694	(0.63-4.56)
No	19 (9.69%)	177 (90.31%)		
BMI				
BMI < 25	14 (14.74%)	81 (85.26%)	2.011	(0.88-4.65)
BMI ≥ 25	11 (7.91%)	128 (92.09%)		

GFR: Glomerular Filtration Rate; OR: Odds ratio; CI: Confidence interval; * Chi-square test or Fisher p < 0.05; BP: Blood pressure; BMI: Body mass index.

It is also important to remember that many are the consequences of CKD. It is currently known that it is both cause and effect of arterial hypertension (AH),[24] which, in turn, is the leading cause of end-stage CKD in Brazil.[3] However, in this study, hypertension was not associated with decreased GFR or albuminuria, a discordant result vis-à-vis other studies carried out in primary care,[5,22] suggesting limitation in sample size or specific characteristics of the study population.

In the United States, approximately 26% of the people with hypertension have CKD.[25] In a comparison between the NHANES surveys of 1988-1994 and 1999-2002, after full adjustment of variables, they found a prevalence of albuminuria and low GFR more strongly linked to certain factors, including hypertension.[26] In a study carried out at two centers of Primary Care in Leiden, the Netherlands,[22] the researchers evaluated 10,740 patients over 25 years, with hypertension alone or diabetes, the main risk factors involved in CKD. Of these, 960 (8.9%) were hypertensive alone. The prevalence of CKD, including all stages, reached 21.1% in nondiabetic hypertensive, with a predominance of stage 3 (17.1%).

In the present study we did not find a significant association between decreased GFR or albuminuria and AH. Among those with high blood pressure, there was a higher percentage of albuminuria (32.43%) compared to those without hypertension (22,40%). The result suggests the presence of a preliminary stage with decreased GFR among non-diabetic hypertensive patients.[26] Consequently, these data point to the need for strict BP control, avoiding progression to CKD in advanced stages.[27]

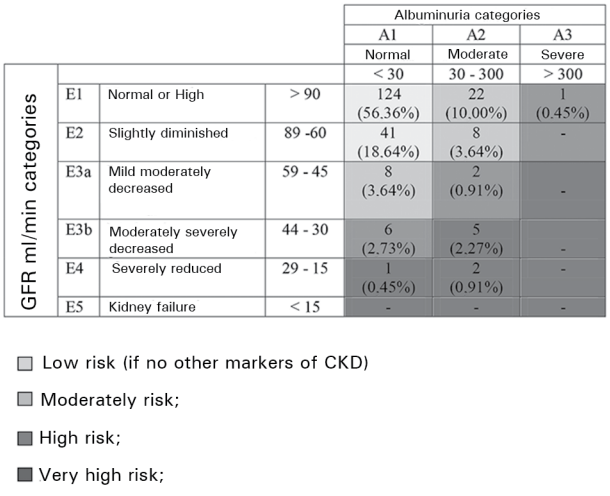
Cigarette smoking, another risk factor evaluated, is associated with the development of albuminuria, which may lead to progressive kidney disease.[28] In addition, according to the *Dialysis Mobidity and Mortality Study (DMMS) Wave 2*, it can be stated that over 40% of the patients on early dialysis are current smokers (16.6%) and former smokers (24.2%).[29] However, in this study there was no significant association between smoking and decreased GFR, or albuminuria. However, it

Table 3 Clinical variables associated with adult albuminuria served in the family health strategy, Goiânia, 2013

Variables	albuminuria ≥ 30 mg/g (n = 65)	albuminuria < 30 mg/g (n = 192)	*p*	OR (IC 95%)
Age (years)				
21-59	42 (21.21%)	156 (78.79%)	0.004*	2.37 (1.27- 4.43)
≥ 60	23 (38.98%)	36 (61.02%)		
Gender				
Males	23 (32.85%)	47 (67.15%)	0.047*	1.69 (0.92-3.095)
Females	42 (22.46%)	145 (77.54%)		
BP				
Increased	24 (32.43%)	50 (67.57%)	0.050	1.66 (0.90-3.02)
Normal	41 (22.40)%	142 (77.60%)		
Alcohol intake				
Yes	27 (32.53%)	56 (67.47%)	0.035*	1.72 (0.95-3.09)
No	38 (21.84%)	136 (78.16%)		
Diabetes				
Yes	15 (48.39%)	16 (51.61%)	0.001*	3.28 (1.50-7.18)
No	50 (22.12%)	176 (77.88%)		
Smoking				
Yes	8 (20.00%)	32 (80.00%)	0.702	1.42 (0.29-1.58)
No	57 (26.27%)	160 (73.73%)		
BMI				
BMI < 25	24 (23.07%)	80 (76.93%)	0.235	0.81 (0.44-1.44)
BMI ≥ 25	41 (27.15%)	110 (72.85%)		

OR: Odds ratio; CI: Confidence interval; * Chi-square test or Fisher p < 0.05; BP: Blood pressure; BMI: Body mass index.

Figure 1. Prognosis of Chronic Kidney Disease (CKD) by glomerular filtration rate (GFR) and albuminuria category.



should be noted that this habit may precipitate CKD,[28] a serious and often irreversible situation. We also stress the proven increased risk of death from heart disease among smokers with CKD.[9]

Still, as regards to the discussion about living habits, it is known that moderate alcohol intake[30] (about 20g of alcohol per day - average amount) has beneficial effects on the individual's risk of developing CKD.[28] On the other hand, excessive intake of alcohol may cause severe damage to the kidneys, predisposing the individual to the development of CKD.[31]

In this study, it became clear that the habit of drinking alcohol was associated with albuminuria ≥ 30 mg/g, which corroborates the results obtained by the *Australian Diabetes, Obesity and Lifestyle study (AusDiab)*,[31] also a population-based study, developed with adults followed up for over 5 years. Australian researchers showed a significant increase in the risk of developing albuminuria among those younger than 65 years of age with daily intake of 30g or more of alcohol.[31] So while light or moderate alcohol intake is beneficial for the renal function under the GFR point of view, it is an important risk factor (> 50%)[31] for the development of albuminuria if consumed in large amounts. Therefore, we should notice a conflict over the kidney protective effect of this substance, as albuminuria is considered a marker of renal injury with an increased risk of developing end-stage CKD.[9]

In relation to another factor analyzed - obesity, we stress the fact that its prevalence is increasing significantly worldwide[1] and, although the cardiovascular risks stemming from this condition are widely recognized, its relation to renal function is often underidentified, despite being considered one of the major modifiable risk factors related to CKD.[32] In addition, the renal disorders attributed to obesity appear to be secondary to glomerular hyperfiltration, as well as the presence of inflammatory mediators from increased fat tissue.[33]

Despite the serious risks reported, in this study there was no significant relationship between overweight/obesity and kidney damage. An important result was found by Panwar *et al.*,[34] in which they reported a lower risk of end-stage CKD in overweight and obese individuals, whereas when associated with metabolic syndrome, the risk more than doubled. Thus, since obesity is part of the metabolic syndrome, it is important to highlight its close relationship with DM, hypertension and CKD.[11,34]

Another important result found in this study refers to the age ≥ 60 years having been the only variable associated with decreased GFR (< 60 mL/min/1.73 m^2), and the presence of albuminuria (> 30 mg/g). In individuals aged ≥ 60 years, chances are 4.21 times greater of a decrease in GFR and 2.37 times higher of developing albuminuria compared to those younger.

When it comes to CKD, it is also important to mention that the majority of older people with the disease is asymptomatic. Nevertheless, after 30 years of age it is expected a gradually decrease in GFR of approximately 8 mL/min/1.73 m^2 every 10 years,[25] a fact stressing that advancing age as an important risk factor for the development of CKD. In this sense, the AusDiab study suggests that more than a third of people aged over 65 have estimated GFR below 60 mL/min/1.73 m^2.[35]

Recent evidence suggests that very old patients (over 80 years) with a modest GFR reduction (45-59 mL/min/1.73 m^2) have a higher prevalence of complications associated with CKD compared to those with GFR ≥ 60 mL/min/1.73 m^2. These patients are also at increased risk of developing cardiovascular events and dying.[36] Thus, screening and monitoring to measure GFR and albuminuria in this age group in the FHS may be necessary.[22]

It is also crucial to carry out the CKD prognosis, which was possible in this study, as proposed in the KDIGO 2012.[9] The analysis revealed that 25% of those evaluated in the ESF had moderate, high and very high risk of developing end-stage CKD in the future or cardiovascular disease.[20] This risk classification proposed by KDIGO in 2012 alerts clinicians and primary care physicians that even patients with GFR > 60 ml/min/1.73 m^2, considered normal, if they have albuminuria, they are at risk for developing cardiovascular or CKD complications, with eventual need for dialysis or transplantation. This signals the importance of proteinuria (albuminuria) in the pathogenesis of CKD progression.[37]

It is also important to pay heed to the dramatic increase in the prevalence of CKD, which has turned the attention of kidney specialists towards the importance of prevention and early detection of this condition, which led to various screening programs across the world.[22,26,38] In study carried out in 13 primary care centers in Belgrado[38] with the help of nephrologists, they concluded that patients with two or three risk factors (such as hypertension, diabetes and age over 60 years) have nearly twice the prevalence of reduced GFR and albuminuria when compared to those who have only one factor. On the other hand, a systematic review failed to show direct evidence of the benefit of CKD screening and CKD monitoring in stages 1-3 vis-à-vis the expected clinical outcomes,[23] so that the potential benefit of this intervention is still unclear. Thus, the authors suggest further and better designed follow up and monitoring studies.[23]

Proper treatment of known non-communicable diseases (previously diagnosed CKD, DM, hypertension or vascular disease), in turn, is more effective in preventing death, facing the incapacity to detect new cases of kidney disease, which makes the first measure a priority when dealing with limited resources.[39] Thus, the target population of this monitoring should be the one with such risk factors, in order to be cost-effective.

This study had some methodological limitations. First, because it is a cross-sectional study, the CKD markers were measured only once, which could generate errors for false-positive or false-negative results. The data does not indicate whether the 4.89% evaluated with GF rates < 60 L/min/1.73 m^2 have CKD or not, since the CKD definition proposed by the KDIGO 2012[9] takes into account the presence of kidney damage (persistent albuminuria) with or without decreasing GFR (< 60 mL/min/1.73 m^2) for

a period of three months or more. Thus, decreased GFR may be due to acute kidney injury,[36] or the albuminuria may be transitory, secondary to physical exercise, fever, urinary tract infection, congestive heart failure, menstruation, diet with high protein intake or drugs (especially non-steroid anti-inflammatory agents, ACE inhibitors and ARBs)[40] not representing CKD. Another limitation was the GFR calculation by the formula proposed by Cocroft-Gault, which may be less accurate in elderly and obese patients.[8]

Conclusion

This study found a high CKD prevalence in early FHS stage, with the following associated factors: age ≥ 60 years, male gender, *diabetes mellitus* and alcohol intake. Therefore, we suggest that adults seen at the FHS should be tracked and monitored for CKD.

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