Prevalence of Chronic Kidney Disease and its Risk Factors Among Elderly Family Practice Patients

Alanta Žilinskienė[1], Vytautas Kuzminskis[1], Asta Stankuvienė[1], Kornelijus Andrijauskas[2], Inga Arūnė Bumblytė[1]

[1]Department of Nephrology, Medical Academy, Lithuanian University of Health Sciences, Kaunas, Lithuania; [2]Department of Family Medicine, Medical Academy, Lithuanian University of Health Sciences, Kaunas, Lithuania

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Abstract. *Background and Objective. According to epidemiological data, every tenth person has chronic kidney disease. In the early stages, it is asymptomatic, and remains undiagnosed and untreated. Experts recommend examining the patients under risk. In Lithuania, there are insufficient data on the prevalence of chronic kidney disease in general population. Therefore, the aim of our study was to elucidate the prevalence of chronic kidney disease and its risk factors among elderly (> 65 years) family practice patients.*

Methods. We reviewed 5880 ambulatory case records of all the patients older than 18 years in 2 primary care centers. We selected the patients with a high risk of chronic kidney disease (CKD) (with severe arterial hypertension, diabetes mellitus, primary kidney diseases, and complicated atherosclerosis). In the second part of the study, we performed the nephrological examination of the patients under risk.

Results. Overall, high risk factors of chronic kidney disease were established for 650 (11.05%) primary care patients. 434 patients (66.8%) having high risk factors of chronic kidney disease were older 65 years. Older patients had more frequent arterial hypertension (70.4% vs. 48.7%, P < 0.05) and cardiovascular disease (6.2% vs. 2.0%, P < 0.05), but fewer of them had primary kidney disease (29.8% vs. 43.1%, P < 0.05) compared with younger patients. Only 57.6% of elderly patients and 54.17% of nonelderly patients came for nephrological examination. Nephrological investigation revealed that elderly patients had more frequent eGFR < 60 mL/min/1.73 m² (45.8% vs. 22.3%, P < 0.001) and CKD (54.4% vs. 35.04%, P < 0.001) compared with younger. In the binary logistic regression analysis, the age over 65 years increased by 2.93 the odds ratio for kidney dysfunction. Elderly patients smoked less (14.5% vs. 27.4%, P = 0.003), had a lower body mass index (28.74 ± 4.49 vs. 30.68 ± 6.64, P = 0.001) and higher systolic blood pressure (155.73 ± 21.76 vs. 149.95 mmHg, P = 0.023)

Conclusion. Elderly population 2 times more often have risk factors, mainly multiple, and by 1.6 times more often were diagnosed with CKD.

Introduction

The elderly population is growing worldwide. In 2003, people aged over 65 years comprised 12% of the total population of the USA. This number is projected to increase to 20% in the USA in 2030 [1]. Parallel to this, there has already been a steady increase in the number of elderly people with chronic kidney disease (CKD) reaching end-stage kidney disease and requiring dialysis. In the United States, patients over 65 years of age represent 40% of end-stage kidney disease population [2]. The similar rise of incidence of end-stage kidney disease is reported in Europe [3]. With a global increase in the aging population, the practice of medicine is increasingly focused on elderly patients with chronic disease. The elderly have quite different health care needs related to their associated comorbidity, frailty, social isolation, poor functional status, and cognitive decline [4]. The cause of kidney disease in the elderly is often multifactorial with underlying hypertension, diabetes, or cardiovascular disease. CKD in different age groups is silent and asymptomatic at earlier stages and quite often undiagnosed, but it can be easily detected by the estimated glomerular filtration rate (GFR) or/and albumin-to-creatinine ratio, as a marker of kidney damage [5,6]. International guidelines have called for earlier referral of CKD patients, but it is unclear how these should apply to elderly adults. In Lithuania, there are 467 chronic dialyzed patients pmp. Of them, 59% are older than 65 years old [7]. Prevalence of CKD in earlier stages among elderly Lithuanian population has not been examined before.

Corresponding author at: Alanta Žilinskienė, Department of Nephrology, Medical Academy, Lithuanian University of Health Sciences, Eivenių str. 2, LT-50161, Kaunas, Lithuania
E-mailing adress: alanta.zilinskiene@gmail.com

The aim of the study was to elucidate the frequency of CKD and its risk factors among the elderly family practice patients.

Material and Methods

In the first part of this study, we reviewed 5880 ambulatory case records of all the patients older than 18 in 2 primary care centers.

The age and gender of the patients was documented.

Based on the data recorded in the patient charts, patients at risk for CKD were identified as having:

1) severe arterial hypertension (blood pressure ⩾ 180/110 mm Hg (III°) or 3 and more antihypertensive drugs);
2) diabetes mellitus of the first and the second type (treated with diet or drugs taken per os or insulin);
3) evident ischemic disease (undergone myocardial infarction, stroke, former ischemic episodes of brain vascular disorders, performed aortocoronary bypass grafting operation or angioplasty, diagnosed peripheral vascular atherosclerosis); only the patients who had two or more combinations of the above mentioned clinical manifestations of ischemic disease were selected to this group;
4) other causes of potential kidney damage–urinary tract infections, urinary stones, lower urinary tract obstruction, unilateral nephrectomy, others.

The patients with a high risk of chronic kidney disease established were invited to a nephrologist's consultation. During the consultation of a nephrologist:

1) anamnestic data were collected, i.e., personal medical history (hypertension, diabetes, kidney disease and/or cardiovascular disease), lifestyle (smoking) and intake of ACEI-inhibitors or ARB;
2) height, weight, arterial blood pressure were measured;
3) serum creatinine, morning urine by dipstick, and albuminuria by dipstick were performed (moderately increased albuminuria was defined as urine albumin-to-creatinine ratio 3–30 mg/mmol; severely increased albuminuria was defined as albumin-to-creatinine ratio > 30 mg/mL);
4) the glomerular filtration rate according to *MDRD* formula and the body mass index (height devided by the square of weight) were calculated.

Chronic kidney disease was diagnosed according to the KDIGO criteria: whatever the reason, if more than 3 months of GFR < 60 mL/min/1.73 m^2 with or without signs of renal damage, it is considered that the patient is suffering from chronic kidney disease.

Statistic data analysis was performed. All analyses and calculations were performed using SPSS software, version 16 (SPSS, Inc., Chicago, Il USA). The data are presented as numbers, percentages or means ± standard deviation for continuous variables. Normality assumption of continuous variables was tested using the Kolmogorov-Smirnov test. Comparison between 2 groups was performed by the Student *t* test for normally distributed variables. When data were not normally distributed, we used the Mann-Whitney and Wilcoxon tests. Categorical data were compared by using the χ^2 test. Binary logistic regression analysis was used to estimate the likelihood of factors that may have an impact on the development of kidney dysfunction. A *P* value of < 0.05 was considered statistically significant.

Results

In the first part of the study, we reviewed the ambulatory charts of all the patients older than 18 years (n = 5880 patients) and identified patients with CKD risk factors. The mean age of all patients was 50.49 ± 19.2. Overall, the high risk factors of chronic kidney disease were established for 650 patients (11.05%). Patients with risk factors were significantly older. The demographic data are shown in Table 1.

The most frequent CKD risk factor was arterial hypertension: 415 (62.6%) of 650 patients having CKD risk factors had severe arterial hypertension. The second risk factor, defined as the primary kidney damage, was present in 219 patients (34.5%) at risk. Diabetes mellitus (Type 1 and 2) was found in 121 patients (20.9%). Complicated cardiovascular disease was established in 32 patients (6.1%). Comparison of the patients with CKD risk factors according to age showed that the group of elderly patients had more frequent arterial hypertension and cardiovascular disease, but less often primary kidney disease (Fig.1).

The elderly patients more often than younger patients had multiple risk factors for CKD: 2 or more CKD risk factors were found in 20.3% (n=88) of patients and only in 12.5% (n=27) of patients in the younger age group, *P* = 0.014.

Table 1. Baseline demographic data of the study population

	Overall n = 5880	Patients with CKD risk factors n = 650
Men	2582 (43.91%)	226 (34.8%)
Women	3298 (56.09%)	424 (65.2%)
Median age (years ± SD)	50.49 ± 19.2	66.1 ± 13.7*
⩽ 65 years	4220 (71.77%)	216 (33.2%)
> 65 years	1660 (28.23%)	434 (66.8%)*

*$P < 0.001$

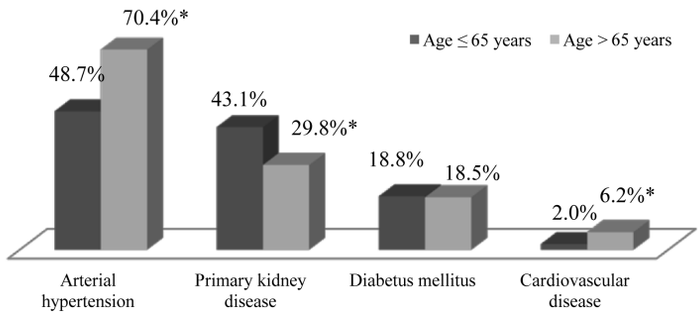

Fig. 1. The distribution of the patients according to the risk factors and age groups in the primary health care link
*$P < 0.05$ between age groups.

When the patients with the risk factors of chronic kidney disease were elucidated, family practitioners were presented with the lists of these patients and they were invited to be sent for a nephrologist's consultation. Only 117 patients (54.17%) from the age group of ⩽ 65 years and 250 (57.6%) from the elderly age group came for a nephrological investigation, $P = 0.406$.

Renal insufficiency, when eGFR < 60 mL/min/1.73 m² was found statistically significantly more frequently in the group of elderly patients (45.8% vs. 22.3%, $P < 0.001$). Presence of albuminuria was found only in 43 (37.4%) elderly patients with a eGFR < 60 mL/min/1.73 m². The remaining 72 (62.6%) patients with eGFR < 60 mL/min/1.73 m² were without albuminuria.

According to our data, the age over 65 years currently increases 2.93 the odds ratio and moderately increased albuminuria 2.943 increases the odds ratio for kidney dysfunction by the binary logistic regression analysis (Table 2).

Following the definition of the KDIGO expert group, CKD was diagnosed in 177 patients (48.2%). In the age group ⩾ 65 years, CKD was diagnosed statistically significantly more frequently than in the younger age group, 54.4% (n=136) vs. 35.04% (n = 41), respectively, $P < 0.001$.

Table 2. Binary logistic regression analysis for risk evaluation of kidney dysfunction (eGFR < 60 mL/min/1.73 m²)

Factor	OR (B)	95 % C.I. for OR (B)	
		Lower	Upper
Age > 65 years	2.93*	1.744	4.966
Moderately increased albuminuria	2.943*	1.737	4.987

*P <0.01.

Only 109 patients (61.58%) with diagnosed CKD were on ACEI/ARB. The elderly patients with CKD were on ACEI/ARB less frequently than younger, but the difference was not statistically significant (58.1% (n = 79) vs. 73.2% (n = 30), $P = 0.08$).

The comparison of the examined patients with CKD risk factors according to age showed that the elderly patients more often had renal dysfunction when eGFR < 60 mL/min/1.73 m², higher systolic blood pressure, a lower body mass index in comparison with younger patients (Table 3).

Table 3. The comparison of patients with risk factors of chronic kidney disease according to age

		Age ⩽ 65 years (n = 117)	Age > 65 years (n = 250)	*P*
Average BP (mm Hg ± SD)	Systolic BP	149.95 ± 20.77	155.73 ± 21.76	**0.023**
	Diastolic BP	89.51 ± 9.6	87.83 ± 10.1	0.145
Average BMI (kg/m² ± SD)		30.68 ± 6.64	28.74 ± 4.49	**0.001**
Use of ACEI/ARB		84 (71.8%)	168 (67.2%)	0.377
Active smoker		32 (27.4%)	36 (14.5%)	**0.003**
Moderately increased albuminuria		17 (14.5%)	56 (22.4%)	0.078
Severely increased albuminuria		7 (6.0%)	18 (7.2%)	0.666
eGFR ≥ 60 mL/min/1.73 m²		88 (77.7%)	135 (54.2%)	**< 0.001**
eGFR < 60 mL/min/1.73 m²		29 (22.3%)	115 (45.8%)	
Mean eGFR (mL/min/1.73 m² ± SD)		72.65 ± 9.15	61.45 ± 17.14	**< 0.001**
Diagnosed CKD		41 (35.04%)	136 (54.4%)	**< 0.001**

Discussion

In 2007, we organised the first study on CKD prevalence in Lithuania and found that 11.2% of the patients of primary health care link had CKD risk factors. Kidney dysfunction was found in almost half of the patients at risk [8]. The prevalence of CKD in elderly population was not examined. The aim of the present study was to evaluate particularly elderly family practice patients. This present study showed that 66.8% of patients with high risk factors of chronic kidney disease were older than 65 years. The elderly patients more frequently have arterial hypertension and cardiovascular disease, but less frequently primary kidney disease compared with younger. Nephrological examination revealed that eGFR < 60 mL/min/1.73 m^2 and systolic hypertension were more frequent in elderly patients. CKD was diagnosed in half of the elderly patients with indentified risk factors.

Our study showed that the most frequent CKD risk factor in elderly patients was arterial hypertension: 70.4% of the patients had arterial hypertension. Others studies have presented that the prevalence of hypertension in elderly population > 60 years old is 60–80% [9,10]. According to the NHANES study data, 67% of US adults aged 60 and older were hypertensive [11]. Overall, hypertension is present in 80% of CKD patients [12]. The prevalence of hypertension in elderly adults with CKD in the PATRIOTIC study in China was 82.0% [13].

The second identified CKD risk factor in our study was primary kidney disease. However, the group of elderly patients less frequently had primary kidney disease compare with younger patients. High prevalence of primary kidney disease in our study could be explained by frequently found kidney cysts and nephrolithiasis. Younger patients were more often diagnosed with primary kidney disease, because an ultrasound examination was more frequently performed. In other studies, there are no data regarding examination of kidney cysts. According to data of different countries, primary kidney disease is not the most common cause of end-stage renal disease. The prevalence of primary kidney disease has been mainly examined in the general population and not in the CKD risk patient groups as in our study. In the residential care home population in the United Kingdom, primary kidney disease was diagnosed only in 5% of patients [14]. In the PolSenior study in Poland, prevalence of nephrolitiasis was estimated to be 6.6% for patients over 65 years [15].

Diabetes followed as the third most frequent risk factor in our study. Diabetes (type 1 and 2) was found in 18.5% of elderly patients. It was not significantly different compared with younger patients. In family doctor's practice in Great Britain, 18.3% patients with CKD suffered from diabetes [16]. Diabetes presents as the dominant risk factor for chronic kidney disease, especially in the elderly. In the USA, one-third of people over 65 years old have diabetes [17]. Based on the study data, the most important demographic change in diabetes prevalence across the world appears to be the increase in the proportion of people > 65 years of age [18].

The patients' activity in arrival for nephrological examination in our study was low. Only 54.17% of the patients from the age group ⩽ 65 years and 57.6% from the elderly patients' group came for a nephrologist's investigation. There was no statistically significant difference between the groups. In an Italian population study, a nephrologist's consultation was requested in only 4.9% of patients with CKD stage 3 and in 55.7% of patients with more severe CKD [19]. Navaneethan SD et al.'s study shows that elderly women, minorities and patients with multiple comorbidities are at risk for non-referral for CKD care [20].

A nephrologist's examination revealed that 54% of elderly patients with risk factors suffered from CKD. Similar data were published by another authors. Of participants aged > 65 years, CKD prevalence was 44% in the KEEP study [21]. In a UK based cross-sectional study, the overall prevalence of CKD (eGFR < 60 mL/min/1.73 m^2) in a population of community-dwelling older people aged at least 75 years was 56.1% [22].

Kidney function declines with age. Therefore, it is not clear to what extent a decline in GFR with age is physiological and what level of GFR should be considered abnormal in older people. The age-related changes in the kidneys may be further complicated by concurrent comorbidities common in old age, such as hypertension, diabetes, congestive cardiac failure, atherosclerosis, urinary tract outflow obstruction, recurrent urinary tract infections and drug-induced nephrotoxicity [23]. Presence of albuminuria was found only in 37.4% of elderly patients with a eGFR < 60 mL/min/1.73 m^2. The remaining 62.6% of patients with eGFR < 60 mL/min/1.73 m^2 were without albuminuria. In the PolSenior study in Poland, 65.7% of elderly subjects had eGFR < 60 mL/min/1.73 m^2 without albuminuria [15].

An angiotensin converting enzyme (ACEI) or an angiotensin receptor blocker (ARB) are recommended as first-line therapy for all patients with chronic kidney disease and can be combined with close monitoring of serum creatinine and potassium to achieve BP and proteinuria goals [5]. In our study, 61.58% of patients with CKD risk factors were on ACEI/ARB. The use of ACEI inhibitors in the elderly is similar in studies conducted by other authors, e.g., in Canada, ACEI was used by 75% of patients over 66 years old with CKD [24]. ACEI use in the elderly is controversial. Onuigbo M.A.C. et al. have reviewed the literature along these lines and reported that ACEIs and ARBs often cause unrec-

ognized significant worsening renal failure in CKD patients, which is sometimes irreversible, and that more caution is required regarding their use, especially in older hypertensive patients, with likely ischemic hypertensive nephropathy [25]. There is less evidence to support the effectiveness of ACE inhibitors and ARBs in slowing the progression of CKD in patients without proteinuria [26].

Obesity is an important risk factor for CKD. Our study showed that the elderly patients were overweight, and non-elderly patients were obese. In the NEOERICA study in Great Britain, body mass index of patients with severe CKD was 27.8 ± 6.1 [27]. The data from the National Health and Nutrition Examination Survey between 2007 and 2010 revealed that more than a third of adults aged 65 were obese. Between 1999–2002 and 2007–2010, the prevalence of obesity among older men over the age of 65 years increased [28]. Another study showed an inverse association between BMI and CKD in elderly adults. In Taiwan, there was an inverse association between BMI and CKD in elderly diabetic patients, but no such association was found in nondiabetic older adults [29]. Chronic pain and depression in the elderly often limits the desire to eat [30, 31].

Conclusion

The elderly people account for two-thirds of practice patients with CKD risk factors. Elderly patients more frequently have arterial hypertension and cardiovascular disease, but less frequently primary kidney disease compare with younger patients. Only half of elderly patients under risk came for a nephrologist's examination. A nephrologist's investigation revealed that elderly patients had more frequent kidney dysfunction (eGFR < 60 mL/min/1.73 m^2) and CKD compared to younger.

Conflicts of interest

The authors report no conflicts of interest.

The authors have obtained the permission by the Biomedical Research Ethics Committee to carry out the study.

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