The Presence of Chronic Kidney Disease in Relation to Age and Duration of Diabetes Mellitus

IONELA MIHAELA VLADU[1#], TIBERIU STEFANITA TENEA COJAN[2*], ALIN DEMETRIAN[3#], OANA MARIANA CRISTEA[4#], CRISTINA GABRIELA ENE[5], DIANA CLENCIU[6]

[1]University of Medicine and Pharmacy of Craiova, Department of Metabolism and Nutrition Diseases, Filantropia Clinical Hospital of Craiova, 1 Filantropiei Str., 200143, Craiova, Romania

[2]University of Medicine and Pharmacy of Craiova, Department of Surgery, CFR Hospital of Craiova, Stirbei-Voda Str., 200374,Craiova, Romania

[3]University of Medicine and Pharmacy of Craiova, Department of Thoracic Surgery, County Hospital Craiova, 2-4 Petru Rares Str.Craiova, 200349 Romania

[4]University of Medicine and Pharmacy of Craiova, Department of Microbiology, County Hospital Craiova, 2-4 Petru Rares Str.Craiova, 200349 Romania

[5]University of Medicine and Pharmacy of Craiova, Pharmacology Department, County Hospital of Craiova, 2-4 Petru Rares Str.,200349, Craiova, Romania

[6]University of Medicine and Pharmacy of Craiova, Department of Metabolism and Nutrition Diseases, Filantropia Clinical Hospital of Craiova, 1 Filantropiei Str., 200143, Craiova, Romania

Chronic kidney disease (CKD) affects about 10-13% of the general population with a small proportion in the terminal renal disease stage requiring renal replacement therapy or renal transplantation. CKD is the new cause of mortality in the US. CKD's prevalence increases with age. Diabetes mellitus is responsible for 50% of cases of chronic kidney disease being the most common cause.

Keywords: Type 1 diabetes mellitus, chronic kidney disease

Chronic kidney disease (CKD) affects about 10-13% of the general population with a small proportion in the terminal renal disease stage requiring renal replacement therapy or renal transplantation. CKD is the new cause of mortality in the US. CKD's prevalence increases with age. Diabetes mellitus is responsible for 50% of cases of chronic kidney disease being the most common cause [1]. Diabetic CKD is the most common cause of chronic renal failure involving renal replacement therapy worldwide, especially in the type 2 diabetes patients [2-4]. Diabetes mellitus (DM) is responsible for 30-40% of the causes of end-stage renal disease in the United States [5-11]. In the past 30 years, the rate of type 1 DM requiring renal replacement therapy declined considerably due to improved treatment strategies for DM and artherial hypertension [12-16].

Diabetes mellitus (DM) is a chronic disease which can evolve towards devastating micro and macro-vascular complications. DM is the most frequent cause of chronic kidney disease (CKD). The diabetic chronic kidney disease (CKD) is a clinical syndrome characterized by persistent albuminuria (albumin/creatinine ratio in the spontaneous urine $\geq$ 30mg/g) and/or a sustained decline of the estimated glomerular filtration rate (eGFR) below 60 mL/min/1.72m^2 [17-20]. If at least one of these values is still maintained within these abnormal limits after 3 months from the first measurement, the diagnosis of diabetic CKD may be established [21-26].

Older age and a long evolution of DM are factors known and shown in numerous studies to be associated with the development and progression of chronic complications in diabetes [27-37]

Experimental part
The aim of the study
The aim of this study was to assess the presence of chronic kidney disease in relation to age and duration of type 1 and type 2 diabetes mellitus.

Material and method

The study type is epidemiological, transversal, non-interventional, with unselected patients. It was performed by analyzing 600 subjects divided into three groups, as follows: Lot 1 includes 200 patients with type 1 diabetes, Lot 2 includes 200 patients with type 2 diabetes and lot 3 (control) consisting of randomly recruited 200 individuals without diabetes.

We recorded demographic data (age, gender), anthropometric data (weight, height, body mass index, waist circumference, hip circumference), personal physiological history (menarhas, births, abortions, fetal macrosomia, menopause), personal pathological history (DM, hypertension, dyslipidaemia, stroke, myocardial infarction, obesity, autoimmune diseases, microvascular complications of DM (retinopathy, diabetic neuropathy, diabetic nephropathy). Patients were questioned about smoking status.

The following laboratory blood counts were performed: serum creatinine, total cholesterol, HDL-cholesterol, triglycerides, uric acid, serum hemoglobin; LDL-cholesterol was calculated with the Friedwald formula.

The estimated glomerular filtration rate was performed by the MDRD 4 method avalable online (http://www.mdcalc.com/mdrd-gfr-equation/) and the CKD prognosis assessment was performed using the KDIGO 2012 risk chart (35).

Recorded data were analyzed using the SPSS software 17.00 (IBM Corporation, Armonk, NY, USA). The methods used were: t-test, Mann-Whitney test, Chi-square test, simple binary logistic regression, multi-parametric logistic regression and multiparametric logistic regression with stepwise covariate selection.

Results and discussions
We conducted a study on 600 subjects (289 women and 311 men) divided into 3 batches.

Patients enrolled in group 1 were 84 (42%) women, 116 (58%) men, in the group 2,101 (50%) women and 99 (50%) men, and in the control group 104 (52%) women 96 (48%) men (fig. 1).
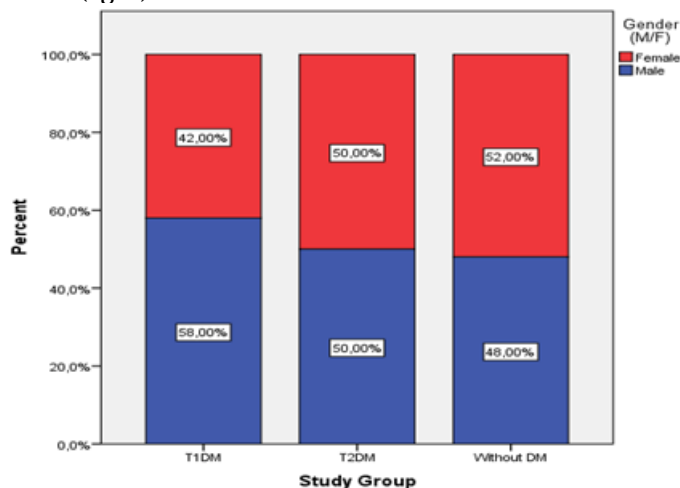

Fig. 1. The repartition of the three studied groups according to the gender of patients

We evaluated the presence of kidney disease in each of the three lots. Based on the KDIGO 2013 criteria, we identified patients diagnosed with CKD with the following variants:

-patients with an estimated glomerular filtration rate (eGFR) < 60mL / min / 1.73mp and absent albuminuria

-patients with an eGFR < 60mL / min / 1.73mp and present albuminuria

-patients with an eGFR > 60mL / min / 1.73mp and present albuminuria

In group 1, diabetic CKD in patients with type 1 DM, was found to be 44.5%; in group 2, in patients with type 2 DM, diabetic CKD was found to be 53.5% and in the control group 8% (fig. 2, yable 1).
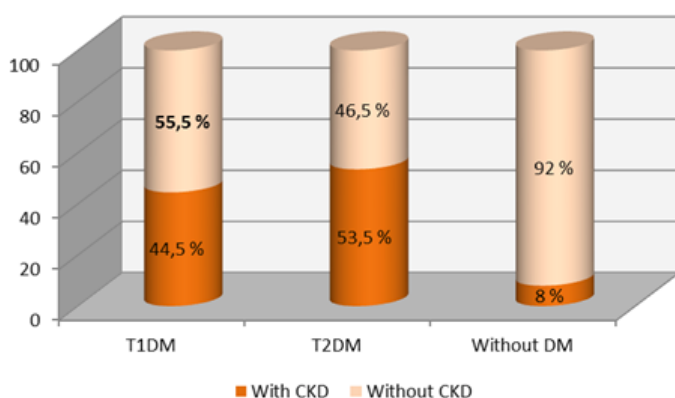
We calculated the coefficient of contingency Phi and Cramer 's V, obtaining the value of 0.412. There is a statistically significant difference between the three groups (p < 0.0001) with respect to the presence of CKD, the highest percentage being seen in patients with type 2 DM, followed by patients with type 1 DM and a small percentage in the control group .

Depending on the estimated glomerular filtration rate, we have staged CKD in the 5 stages. Figures 3-5 highlight the presence of CKD for each group.

The patients analyzed were in varying degrees of CKD after the KDIGO classification in 2012. Thus, in group 1, most patients were in stage 2 of CKD (53.93%), followed by stage 1 (25.85%), Stage 3a (11.23%), Stage 3b and G4 (3.37%), Stage 5 representing 2.25% (fig. 3).

In group 2, most patients were still in stage 2 of CKD (42.99%), followed by Stage 3a (26.16%), then Stage 1 (20.57%), Stage 3b (7.48%), Stage 4 0.94% and 1.86% in Stage 5 (fig. 4).

In the control group, half of patients with BCR were in stage 3a (50%), followed by stage 2 (18.75%), 3b and 4 each in 12.5%, respectively stage 5 (6, 25%) (fig. 5).

The age of patients with type 1 diabetes who have chronic kidney disease (CKD) was lower versus the age of patients with type 2 diabetes and CKD, but comparable between patients with type 2 diabetes and those without diabetes (control). This was proven by the Mann-Whitney U and Wilcoxon W statistical tests, showing significant differences between age of patients with type 2 diabetes with CKD and the age of patients with T1DM with CKD (p < 0.001) between patients with diabetes type 1 with CKD those without diabetes (control) with CKD (p < 0.001), but not significant between type 2 diabetes and CKD control group (p = 0.910) (fig. 6, table 2).

The average age of developing CKD in type 1 diabetes was around 43.55 years; in T2DM the average age was
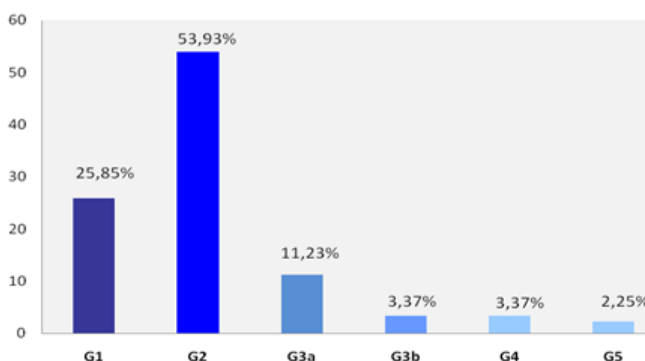

Fig. 2. The presence of diabetic CKD in the three groups (subjects with type 1 DM, type 2 DM and control group)

Fig. 3. Stage distribution of diabetic CKD in patients with type 1 DM

GROUP	Diabetic CKD		TOTAL
	NO	YES	
GROUP 1 = T1DM	111	89	200
	55.5%	44.5%	100.0%
GROUP 2 = T2DM	93	107	200
	46.5%	53.5%	100.0%
GROUP 3 = Without DM	184	16	200
	92.0%	8.0%	100.0%
TOTAL	388	212	600
	64.7%	35.3%	100.0%

Table 1
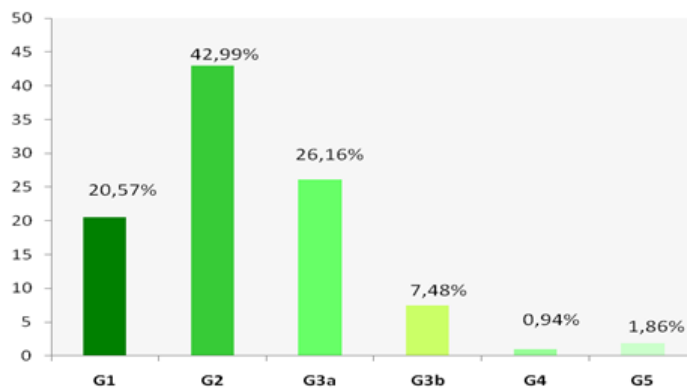THE PRESENCE OF DIABETIC CKD IN THE THREE GROUPS

http://www.revistadechimie.ro

Fig. 4. Stage distribution of diabetic CKD in patients with type 2 DM
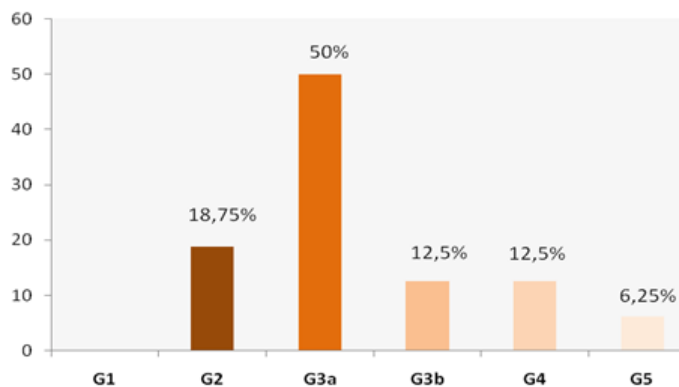
Fig. 5. Stage distribution of diabetic CKD in control group

Fig. 6. Correlation between age and the presence of chronic kidney disease in the three groups

Table 2
DIABETIC CKD IN RELATION TO THE AGE OF PATIENTS WITH DM

	T1DM	T2DM
P – value	< 0.0001	0.012
Odds ratio	1.083	1.039
95% CI	1.054-1.113	1.008-1.070

64.93 years and 63.94 years in the control group. The Kruskal Wallis statistical test showed statistically significant differences between type 1 and type 2 diabetes and between T1DM and the control group (p <0.001), but not significant between T2DM and the control group (table 3).

The age of patients at diagnosis of diabetes with CKD was statistically significant (p <0.001) lower in patients with type 1 diabetes than in those with type 2 diabetes. Applying the statistical Mann-Whitney U test and Wilcoxo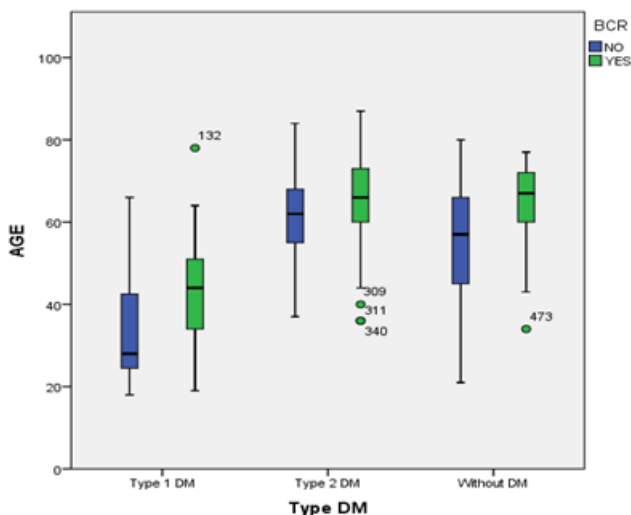n W we found significant differences between age diagnosing diabetes in patients with type 1 diabetes compared with CKD aged patients with type 2 diabetes with CKD (p <0.001) (fig. 7).

The average duration of development of type 1 diabetes associated with CKD stood around 20 years, being statistically significant (p <0.001) higher compared to the duration of 8.5 years of development in patients with type 2 diabetes associated with CKD (fig. 8, table 4). The Kruskal Wallis statistical test applied showed statistically significant differences between type 1 and type 2 diabetes mellitus (p <0.001).

AGE		N	Media	Std. Deviation	Minim	Maxim
	Control Group (without DM)	16	63.94	11.953	34	77
	T1DM	89	43.55	10.744	19	78
	T2DM	107	64.93	9.921	36	87
	Total	212	55.88	14.774	19	87

Table 3
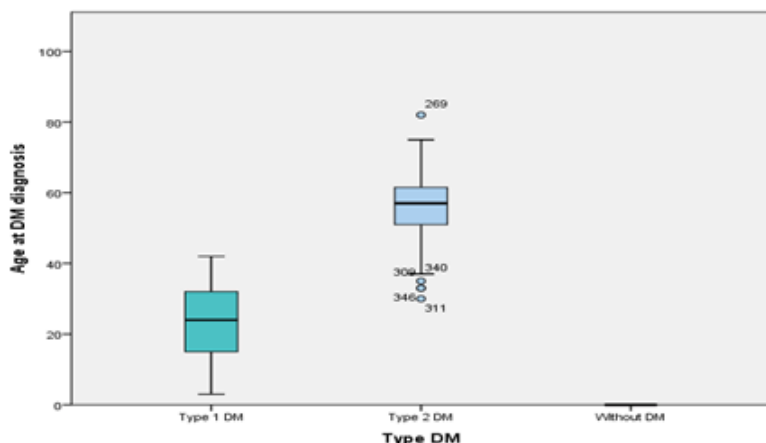THE MEAN AGE OF CKD IN THE SUBJECTS OF THE 3 GROUPS

Fig. 7. The correlation between age at diagnosis of DM and the presence of CKD in the three groups
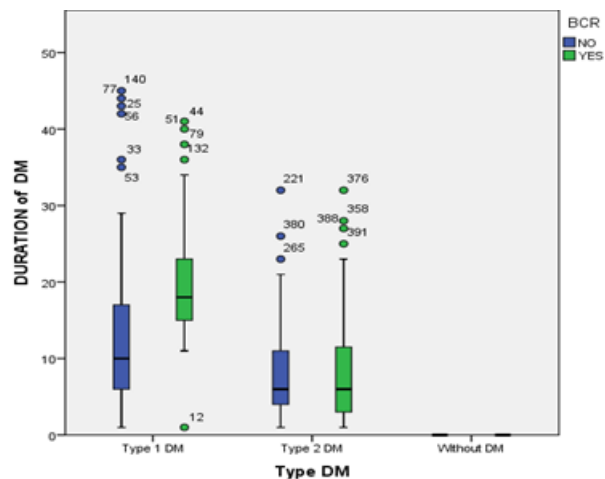
Fig. 8. The correlation between duration of DM and the presence of CKD in the three groups

		N	Media	Std. Deviation	Minim	Maxim
Duration of DM	Control Group (without DM)	16	.00	.000	0	0
	T1DM	89	20.01	6.595	11	41
	T2DM	107	8.50	6.912	1	32
	Total	212	12.69	9.265	0	41

Table 4
AVERAGE AGE OF CKD IN THE SUBJECTS OF THE 3 GROUPS

Conclusions

Diabetic CKD prevalence increases with age and duration of diabetes. Age of occurrence of CKD is lower in patients with type 1 diabetes compared to those with type 2 and the general population. CKD incidence and prevalence increases with age. Old age seems to be a negative predictor for the occurrence of end stage of CKD.

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