

# PULMONARY HYPERTENSION IN NON-DIALYSIS-DEPENDENT AND DIALYSIS-DEPENDENT CHRONIC KIDNEY DISEASE AS A FACTOR FOR CARDIAC REMODELING

Maria Vasilyeva, Tatiana Rudenko, Mikhail Shvetsov, Nina Solomakhina, Irina Kutyrina

Sechenov First Moscow State Medical University  
Moscow, Russian Federation

## INTRODUCTION AND AIMS

Pulmonary hypertension (PH) in patients with chronic kidney disease (CKD) is a newly described entity of cardiorenal syndrome. Although it was considered that PH is associated with end-stage renal disease (ESRD) there is growing evidence that it can be revealed in early CKD stages.

## METHODS

The aim of the study was to evaluate the prevalence and determinants of PH in patients with chronic kidney disease and its association with cardiac remodeling. 86 patients (53% male and 47% female, mean age 45±13 years) with nondiabetic CKD were included to the study. According to the value of estimated glomerular filtration rate (eGFR), the patients were divided into 3 groups: 1) 33 patients with a eGFR of 89-45 ml/min/1.73m<sup>2</sup>; 2) 33 with a eGFR of 44-15 ml/min/1.73m<sup>2</sup>; 3) 20 hemodialysis patients with a eGFR of <15 ml/min/1.73m<sup>2</sup>. A control group included 20 individuals with a eGFR>90 ml/min/1.73m<sup>2</sup>. In all patients physical examination and transthoracic Doppler echocardiography were performed and serum Cystatin C and plasma N-terminal brain natriuretic peptide (NT-proBNP) were measured. PH was defined as pulmonary artery systolic pressure (PASP) ≥25 mmHg.

## RESULTS

PH prevalence was 24.4% (21/86). Its rate depended on CKD stage: in groups 1, 2 and 3 PH was detected in 18.2%; 24.2% and 35.0% ( $p<0,05$  vs group1), respectively (Fig.1). It was not found in the control group.

PASP correlated negatively with GFR ( $R_s=-0.23$ ;  $p=0,02$ ) and positively with systolic blood pressure ( $R_s=0.35$ ;  $p=0.001$ ). PASP also correlated positively with right ventricular size index ( $R_s=0,45$   $p<0,0001$ ), right atrial volume index ( $R_s=0.3$ ;  $p=0.02$ ), left atrial volume index ( $R_s=0.3$ ;  $p=0.009$ ) and left ventricular mass index ( $R_s=0.35$ ;  $p=0.03$ ). (Table 1).

In non-dialysis-dependent CKD group PH was detected 3,1 times higher in patients with left ventricular hypertrophy (LVH) compared with those without LVH (57% vs 18.3%;  $p<0.05$ ). In hemodialysis patients PH was detected 4.6 times higher in patients with LVH compared with those without LVH (23.1% vs 5%;  $p<0,05$ ). (Fig.2 )

PASP correlated with plasma NT-proBNP. In patients with PH the level of NT-proBNP was higher compared with patients without PH (37.43 [5.83; 59.84] vs 8.54 [5.1; 20.43] fmol/ml,  $p=0,01$ ). Cystatin C serum level correlated with PASP ( $\rho=0.32$ ;  $p=0.003$ ). The level of Cystatin C>1045 ng/ml predicted the development of PH with a sensitivity of 71% and a specificity of 60% for predialysis CKD patients. (Fig.3 )

Serum levels of NT-proBNP, cystatin C, left ventricular mass index, right ventricular size index, left atrial volume index and arterial hypertension were included into multivariate logistic regression analysis, PH was independently related with NT-proBNP ( $\beta=0.34$ ;  $p=0.008$ ) and right ventricular size index ( $\beta=0.3$ ;  $p=0.002$ ). PASP was independent determinant of right ventricular size index ( $\beta=0.37$ ;  $p=0.004$ ).

## CONCLUSION

In our study PH was detected in early stages CKD patients. PH development was associated with renal function decline, arterial hypertension and cardiac remodeling. Identifying of the PH mechanisms may be helpful to reduce the cardiovascular risk in CKD patients.

Fig. 1. Prevalence of pulmonary hypertension in patients with different stages of CKD.

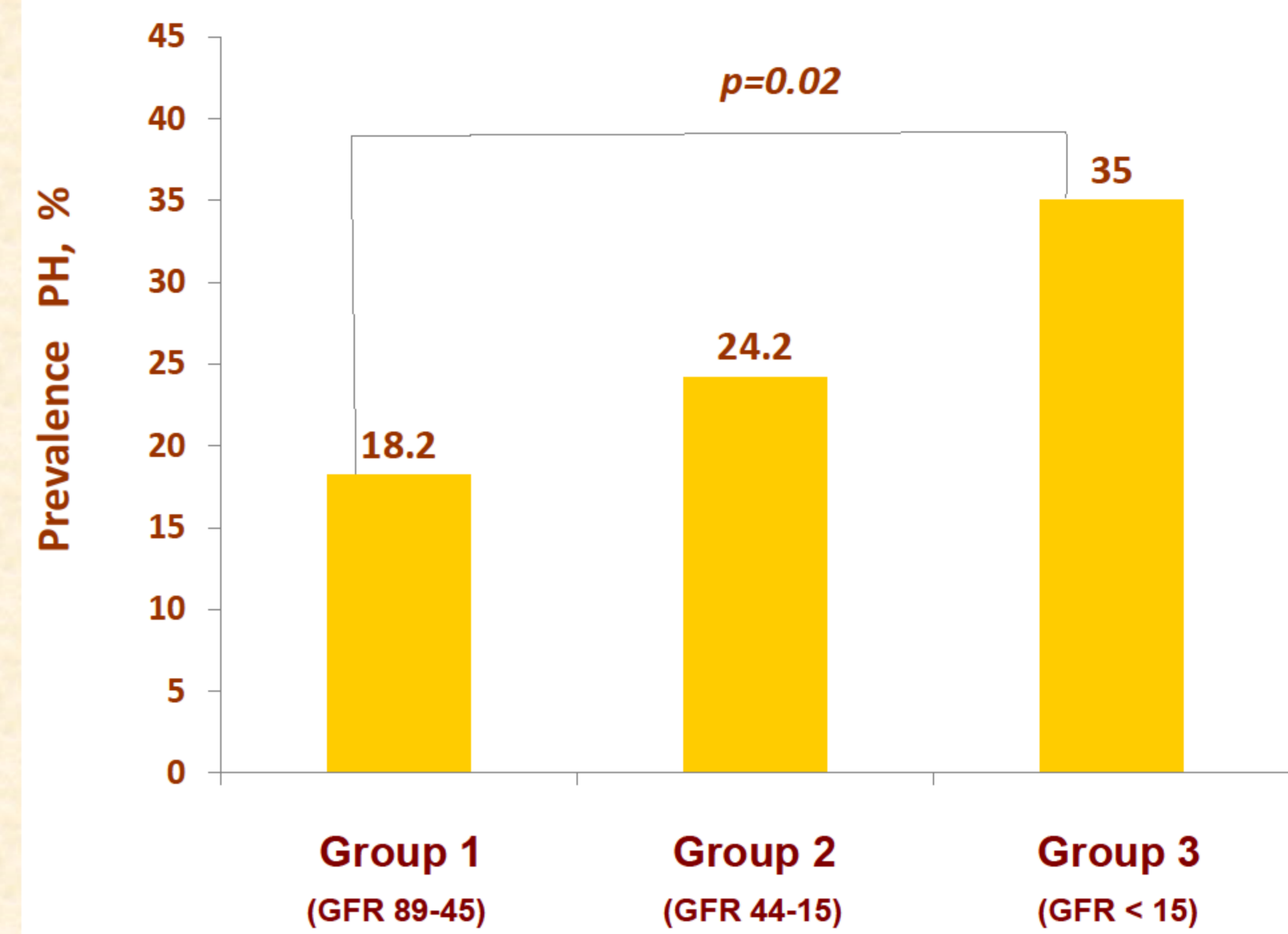


Table 1. Correlation between pulmonary artery pressure and echocardiographic data in CKD patients.

Echocardiography parameters	PASP mm Hg	$\rho$	$p$
Left atrial volume index, ml/m <sup>2</sup>		0.3	0.009
Left ventricular mass index, g/m <sup>2</sup>		0.35	0.03
Right ventricular size index, cm/m <sup>2</sup>		0.45	< 0.0001
Right atrial volume index, ml/m <sup>2</sup>		0.3	0.02
E/A		-0.15	0.12

Fig. 2. Prevalence of pulmonary hypertension in patients with and without left ventricular hypertrophy

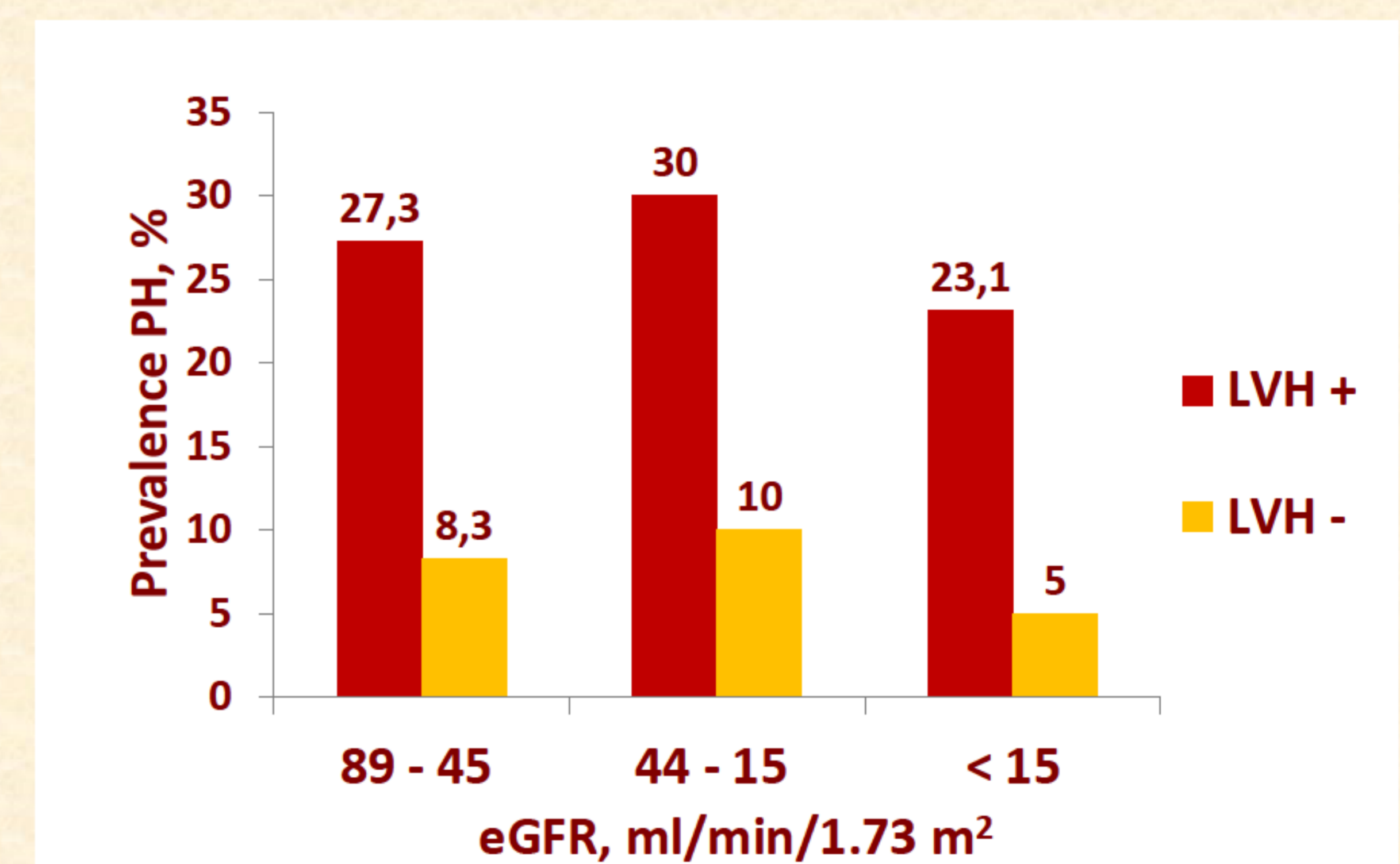


Fig. 3. ROC-curve for Cystatin C serum concentrations in predicting pulmonary hypertension for predialysis CKD patients

