

Early markers of kidney injury in children with obesity



Katarzyna Maćkowiak-Lewandowicz¹, Danuta Ostalska-Nowicka¹, Bogda Skowrońska², Izabela Krzyśko-Pieczka², Piotr Fichna², Jacek Zachwieja¹

¹Clinic of Cardiology, Nephrology and Hypertension of Developmental Age in Poznań

²Clinic of Diabetology and Obesity Developmental Age in Poznań
Karol Marcinkowski University of Medical Sciences in Poznań

INTRODUCTION AND AIMS:

The number of obese children is incredibly increasing what obliges to search for new methods of discovering primitively asymptomatic disorders, such as obesity-related glomerulopathy (ORG). Finally this disease manifests as moderate proteinuria and glomerular hyperfiltration, rarely causing chronic kidney disease. The aim of the study was to explore and analyze renal complications in obese patients. The study evaluated the association between biomarkers of early renal injury such as: neutrophil gelatinase associated lipocalin (NGAL), angiotensinogen (AGT), kidney injury molecule-1 (KIM-1) and obesity in childhood.

METHODS:

80 patients with obesity (44 boys and 36 girls), aged from 3-17 years were included into the study. The control group comprised of 22 healthy children. Serum creatinine, uric acid, cystatin C, NGAL, additionally serum and urine KIM-1, AGT and proteinuria were analyzed. Glomerular filtration rate (GFR) was evaluated by Schwartz and Filler formula. ANOVA test and multiple logistic regression analysis were performed. $P < 0,05$ was considered statistically significant.

Figure 1. Comparison of the mean GFR values (according to the Filler formula) for the study and the control group

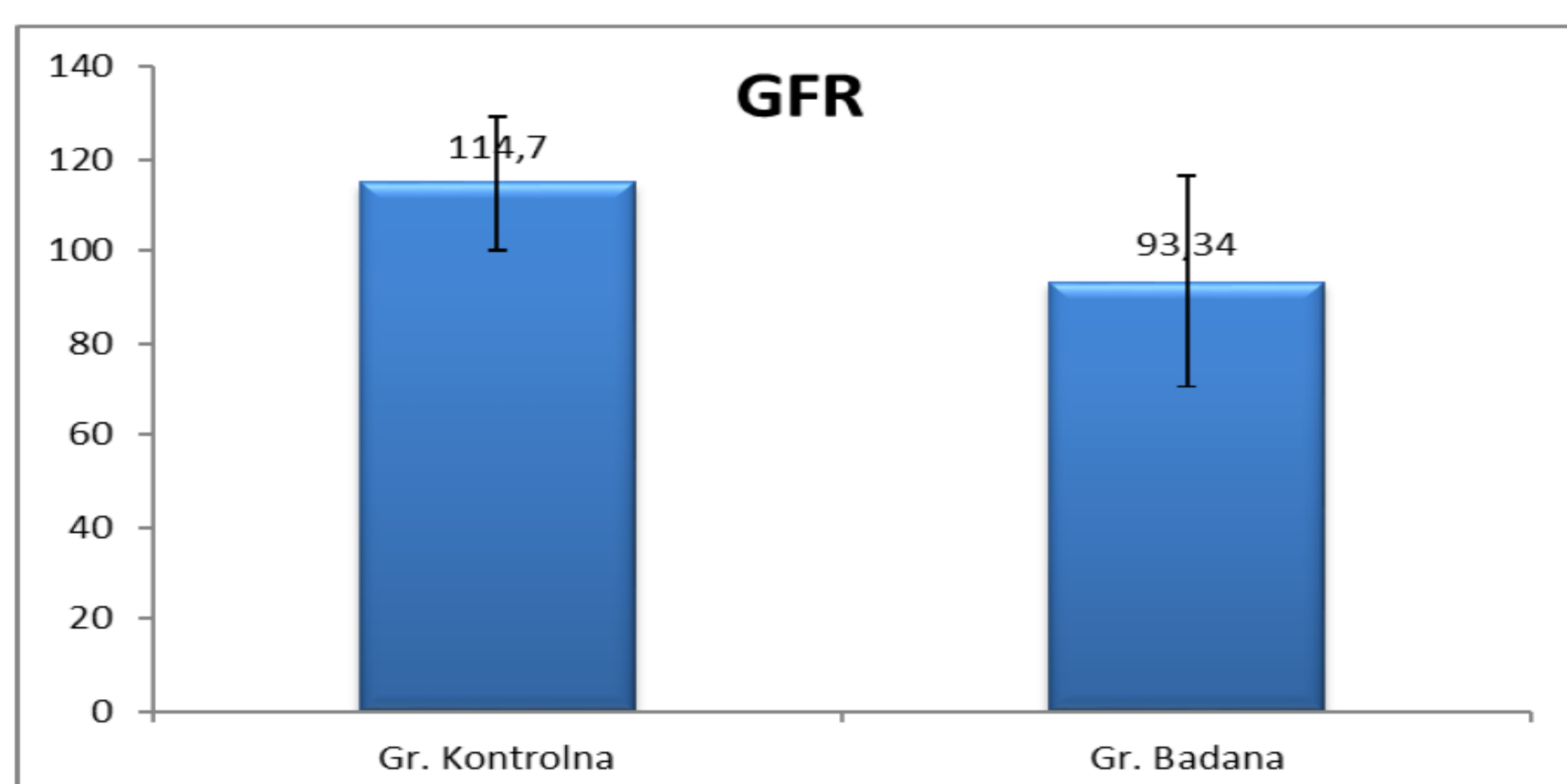


Figure 4. Correlation between the concentration of cystatin C and angiotensinogen in the blood serum in obese patients

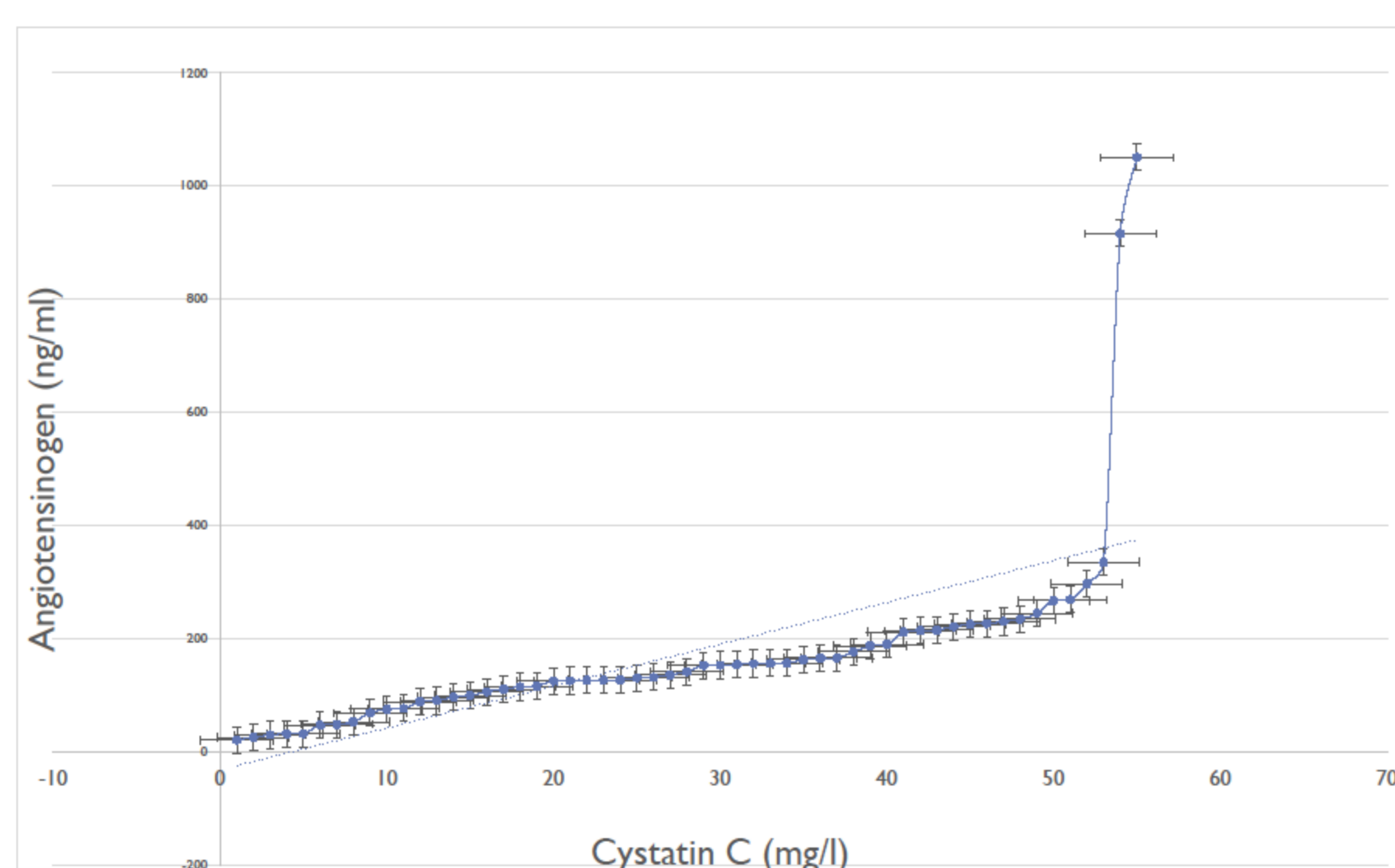


Figure 2. Comparison of the mean values of NGAL in the blood serum in the study and the control group

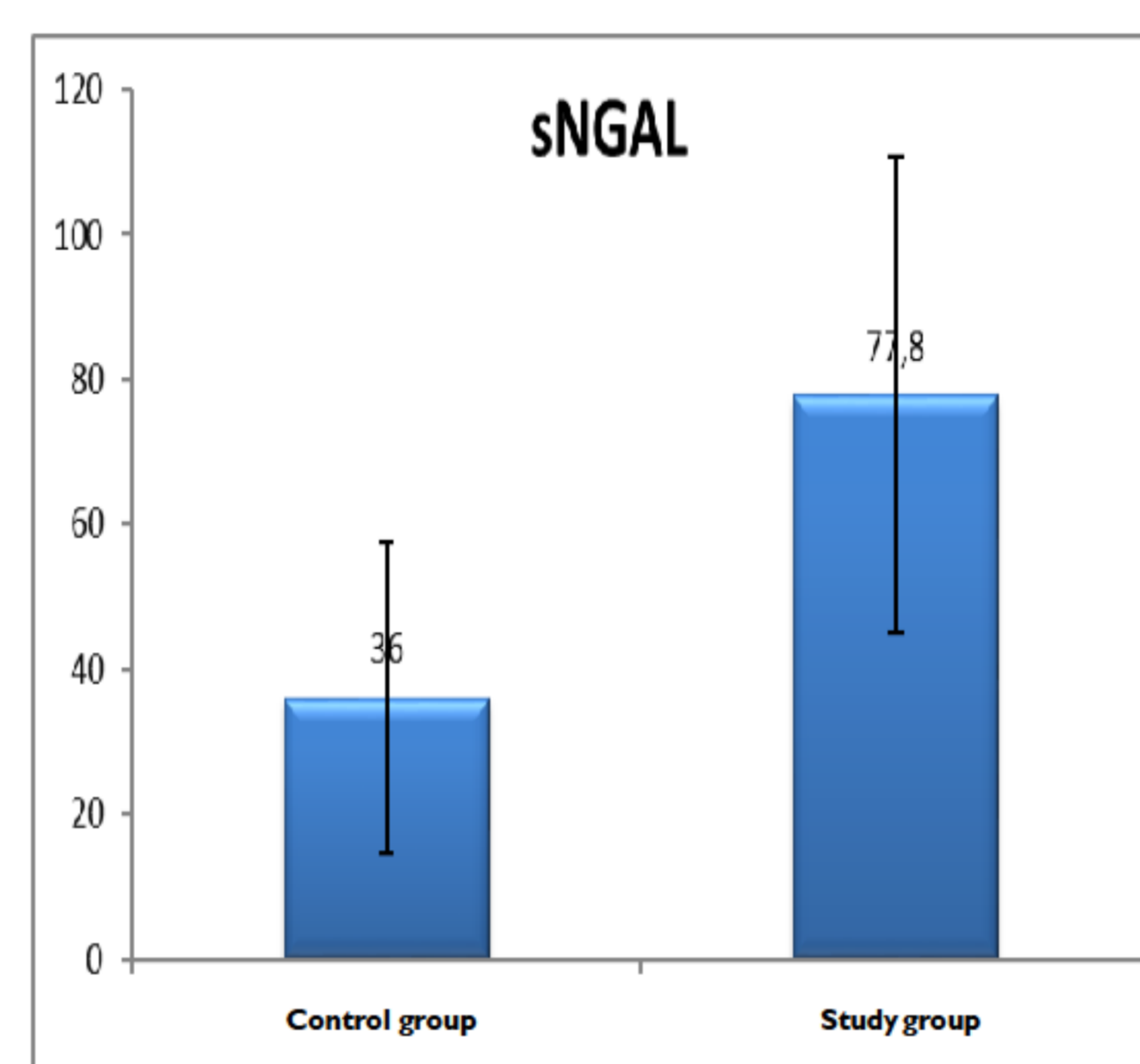


Figure 3. Comparison of the mean values of angiotensinogen concentrations in urine in the study and the control group

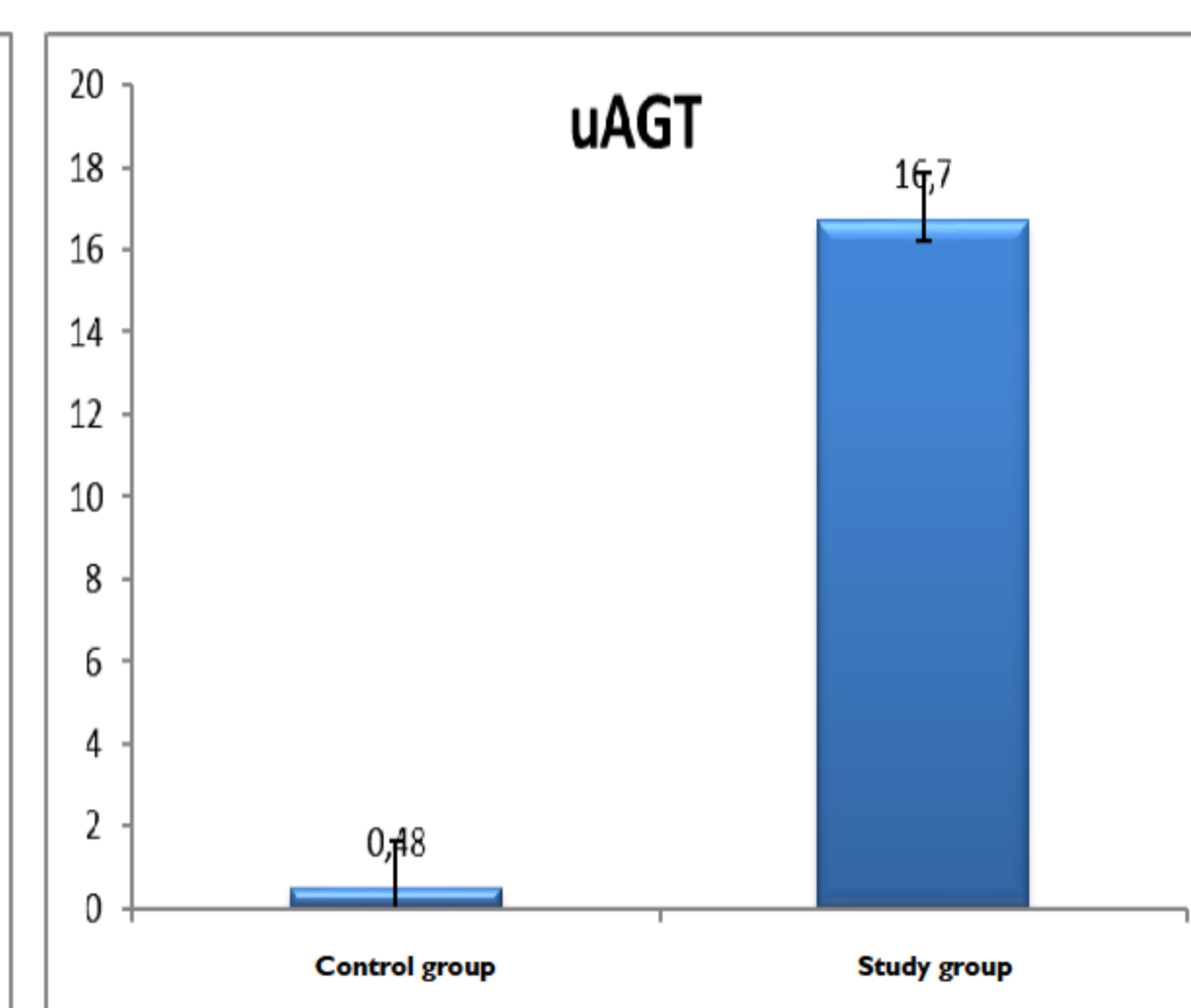


Table 1. Mean concentration of NGAL, AGT, KIM, and cystatin in the blood serum, and of AGT and KIM in urine, determined for the control and the study group

	Study group	Control group	Significance level
sNGAL (ng/ml)	77.8	36.1	P=0.006
sAGT (ng/ml)	159.6	468.8	No significance
uAGT (ng/ml)	16.7	0.48	P<0.0001
sKIM (ng/ml)	0	0	No significance
uKIM (ng/ml)	0.81	0.21	No significance
Cystatin (mg/l)	1.031	0.86	P=0.05

RESULTS:

Significant correlation between increased body mass index (BMI) and concentrations of creatinine, urea and cystatin C in plasma was found. 5,1% obese children had low range proteinuria. Hyperfiltration, defined as GFR above 135 ml / min / 1,73 m², was observed in 13,7% of patients with obesity and in 36,8% of healthy children. GFR (Filler formula) was lower in obese patients (fig. 1) than in the control group ($p = 0,005$). Moreover, angiotensinogen (fig. 2) and NGAL (fig. 3) were higher in obese patients ($p < 0,001$; $p = 0,006$). No statistically significant, elevated values of the KIM-1 marker ($p = 0.1083$), determined both from the blood serum, and urine in obese patients, as compared to the control group, were found (tab. 1). With the increase of the concentration of cystatin C, assessed only in the study group ($p = 0.0403$), higher AGT values were found in the blood serum of patients with obesity (fig. 4).

CONCLUSIONS:

The concentrations of serum NGAL and urine angiotensinogen are significantly increased in obese patients. Those markers can be the early prognostic indicators of asymptomatic obesity-related glomerulopathy.

