

# SERUM LDH LEVEL IS ASSOCIATED WITH DECREASED eGFR AND PROTEINURIA IN PATIENTS WITH GLOMERULONEPHRITIS

Seong Kwon Ma, Ha Yeon Kim, Chang Seong Kim, Eun Hui Bae, Soo Wan Kim

Department of Internal Medicine, Chonnam National University Medical School, Gwangju, Republic of Korea



## Objectives:

- Lactate dehydrogenase (LDH) is expressed in almost all human tissues and it is released into the blood stream during cellular injury.
- Although LDH is expressed in the kidney, the relationship between serum LDH level and kidney diseases has not yet been established.
- We investigated the relationship between serum LDH level and estimated glomerular filtration rate (eGFR) or proteinuria in patients with glomerulonephritis (GN).
- We also investigated the protein expression of LDH in the kidney of experimental renal ischemia/reperfusion (I/R) injury and puromycin aminonucleoside (PAN)-induced nephrotic syndrome.

## Methods:

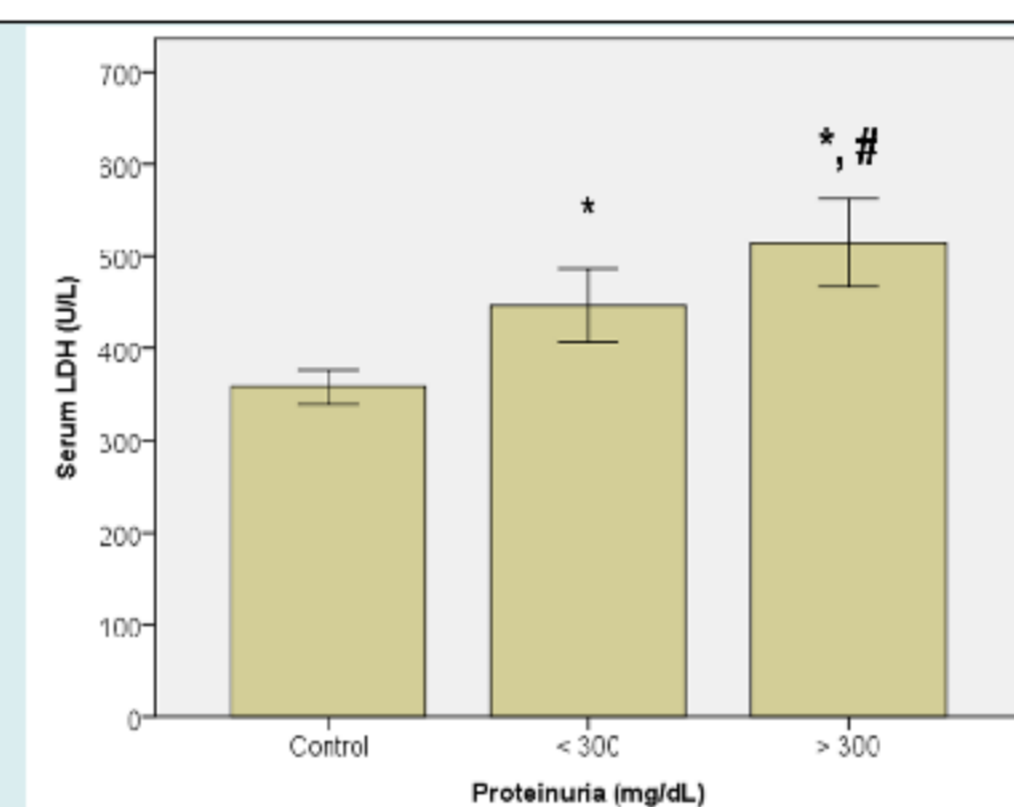
- We conducted a retrospective study of patients with GN (n=104) and control patients (n=28).
- We analyzed clinical parameters including serum LDH, CKD-EPI eGFR, serum albumin and proteinuria by using one-way ANOVA, post hoc Tukey HSD test, and Pearson's correlation coefficient.
- Renal I/R injury in mice was induced by clamping of both renal pedicles for 25 min.
- PAN-induced nephrotic syndrome in rats was induced by a single intravenous injection of PAN via the femoral vein.
- The renal expression of LDH was determined by semiquantitative immunoblotting and immunohistochemistry.

## Results:

**Table 1.** Association between serum LDH level and proteinuria.

	Control (n=28)	Moderate proteinuria (n=60)	Severe proteinuria (n=44)
Age (years)	41.75±3.78	39.77±2.28	45.66±2.57
Sex (male/female)	18/10	35/25	21/20
LDH (U/L)	358.36±9.39	446.93±19.83 <sup>*</sup>	515.63±24.02 <sup>*#</sup>
Serum Cr (mg/dL)	0.75±0.03	1.40±0.16 <sup>*</sup>	1.36±0.13 <sup>*</sup>
BUN (mg/dL)	13.84±0.70	24.08±1.99 <sup>*</sup>	23.99±1.94 <sup>*</sup>
CKD-MDRD	112.51±5.84	84.91±6.96 <sup>*</sup>	76.96±7.66 <sup>*</sup>
CKD-EPI	110.66±4.12	82.89±5.45 <sup>*</sup>	75.09±6.04 <sup>*</sup>
Proteinuria (g/day)	0.09±0.02	3.20±0.70 <sup>*</sup>	9.60±1.26 <sup>*#</sup>
Serum albumin (g/dL)	4.43±0.07	3.50±0.11 <sup>*</sup>	2.55±0.12 <sup>*#</sup>

Values are expressed as mean±SEM. Moderate proteinuria = < 300 mg/dL. Severe proteinuria = > 300 mg/dL. \* p < 0.05 compared with control group. # p < 0.05 compared with moderate proteinuria group.

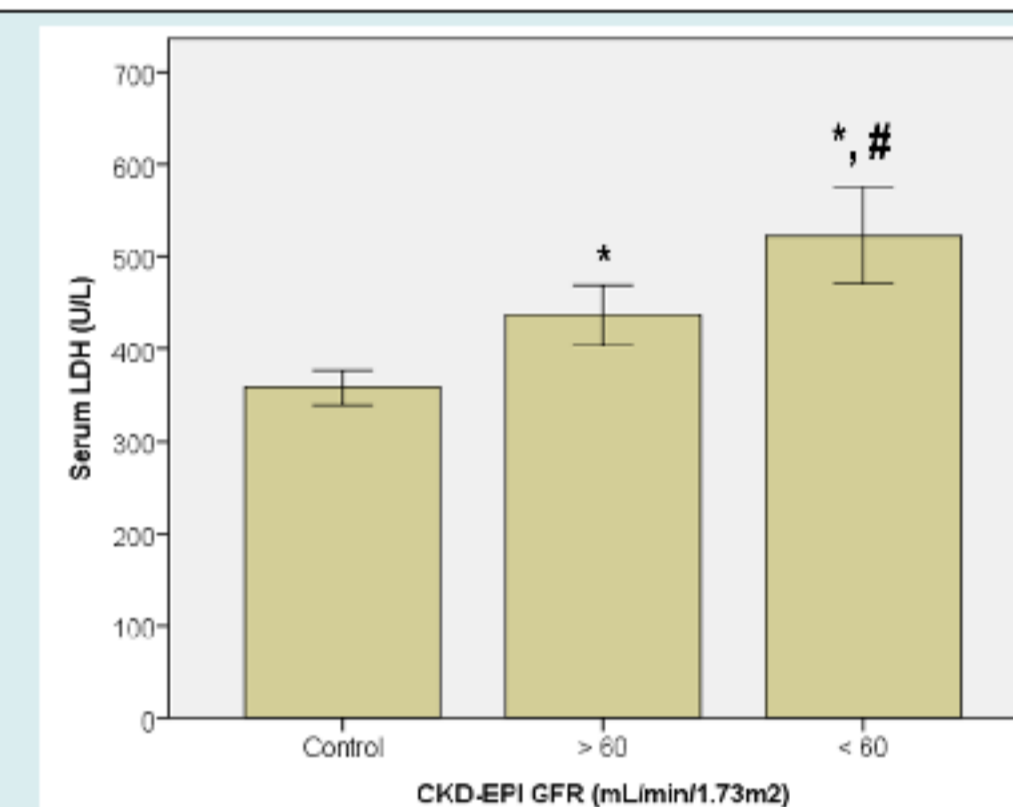


**Figure 1.** Serum LDH levels were higher in patients with severe proteinuria. \*p < 0.05 vs. control group. #p < 0.05 vs. moderate proteinuria group.

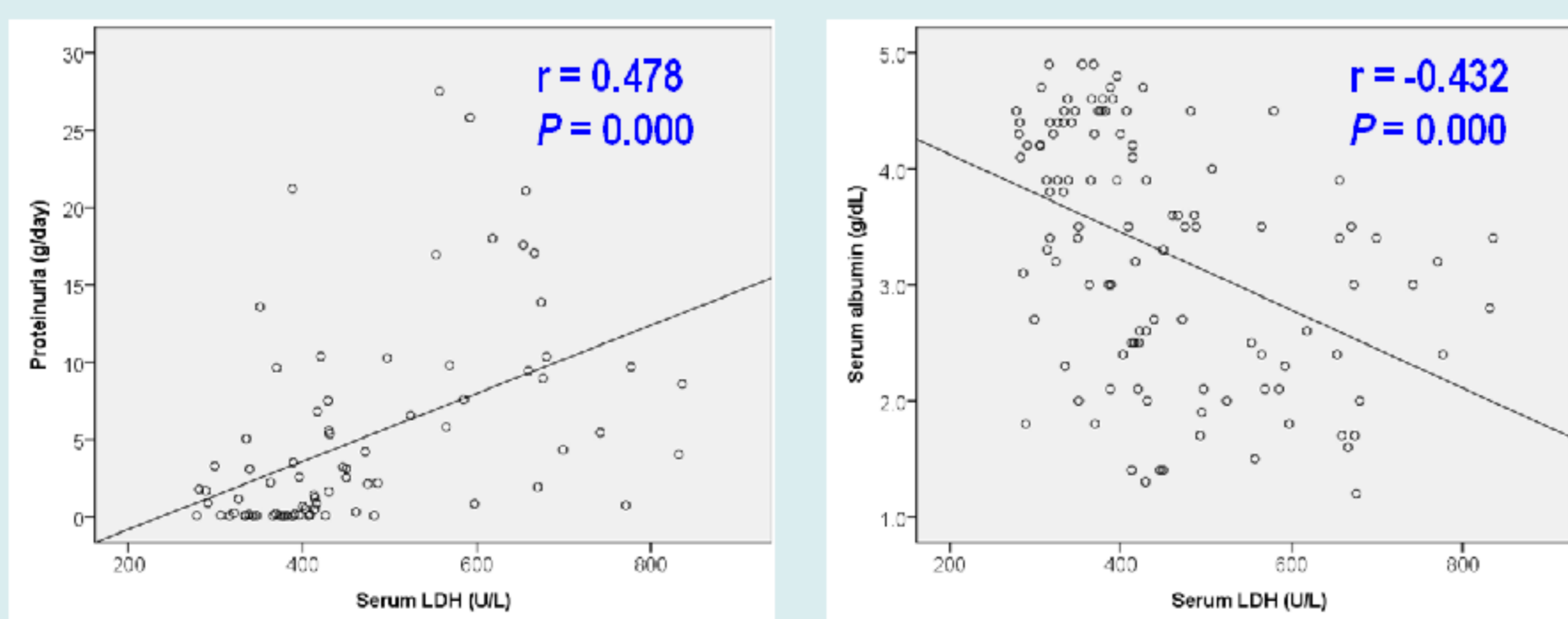
**Table 2.** Association between serum LDH level and eGFR.

	Group-1 (n=28)	Group-2 (n=63)	Group-3 (n=11)
Age (years)	41.75±3.78	36.54±2.01	51.05±2.44 <sup>*</sup>
Sex (male/female)	18/10	34/29	25/16
LDH (U/L)	358.36±9.39	436.56±16.09 <sup>*</sup>	522.97±26.24 <sup>*#</sup>
Serum Cr (mg/dL)	0.75±0.03	0.78±0.03	2.30±0.19 <sup>*#</sup>
BUN (mg/dL)	13.84±0.70	15.96±0.78	36.46±2.26 <sup>*#</sup>
CKD-MDRD	112.51±5.84	112.70±5.60	33.68±2.05 <sup>*#</sup>
CKD-EPI	110.66±4.12	108.15±3.08	35.70±2.25 <sup>*#</sup>
Proteinuria (g/day)	0.09±0.02	3.97±0.88 <sup>*</sup>	9.13±1.27 <sup>*#</sup>
Serum albumin (g/dL)	4.43±0.07	3.23±0.13 <sup>*</sup>	2.90±0.12 <sup>*#</sup>

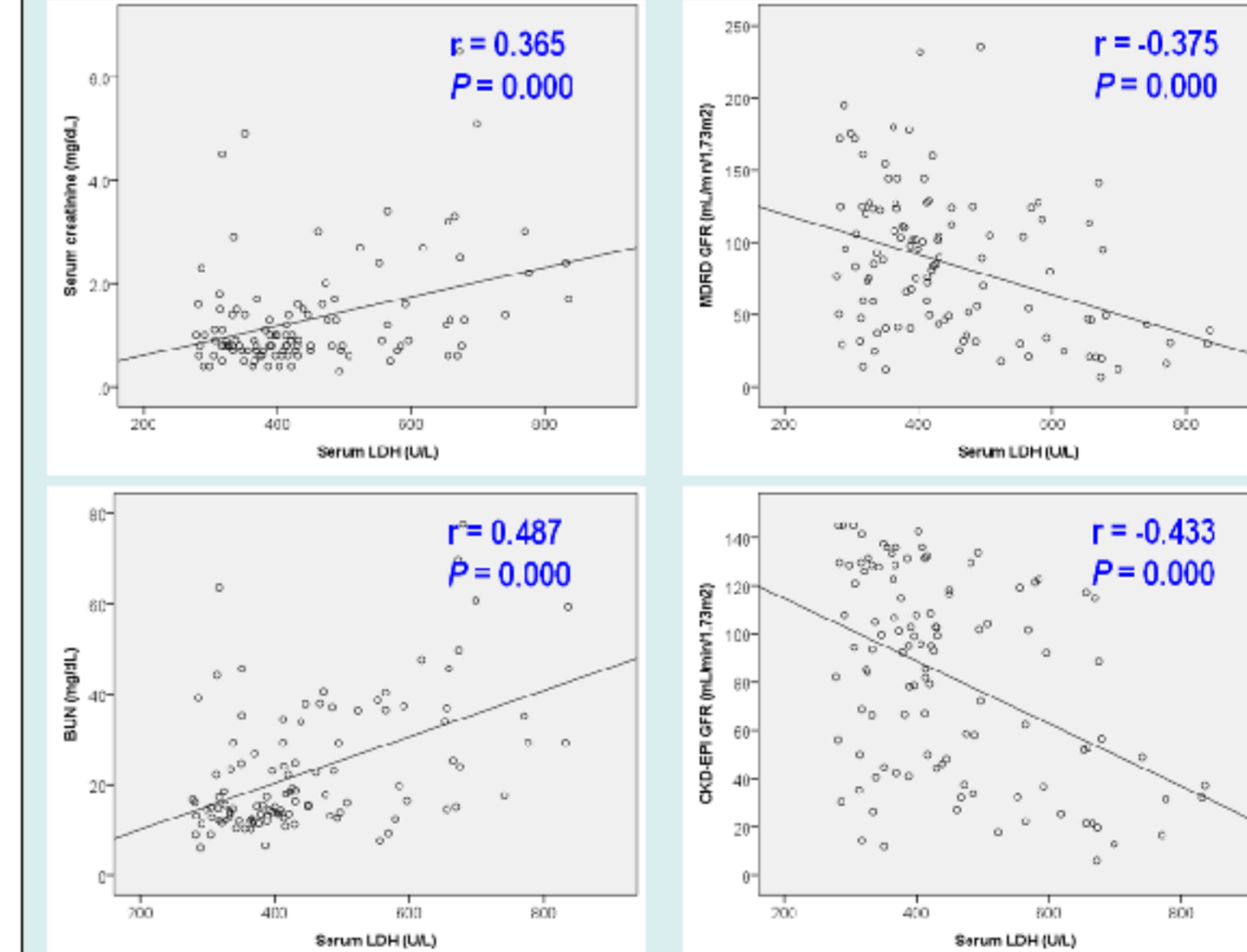
Values are expressed as mean±SEM. Group-1 = Control, Group-2 = GN with CKD-EPI eGFR > 60 mL/min/1.73m<sup>2</sup>. Group-3 = GN with CKD-EPI eGFR < 60 mL/min/1.73m<sup>2</sup>. \* p < 0.05 compared with group-1. # p < 0.05 compared with group-2.



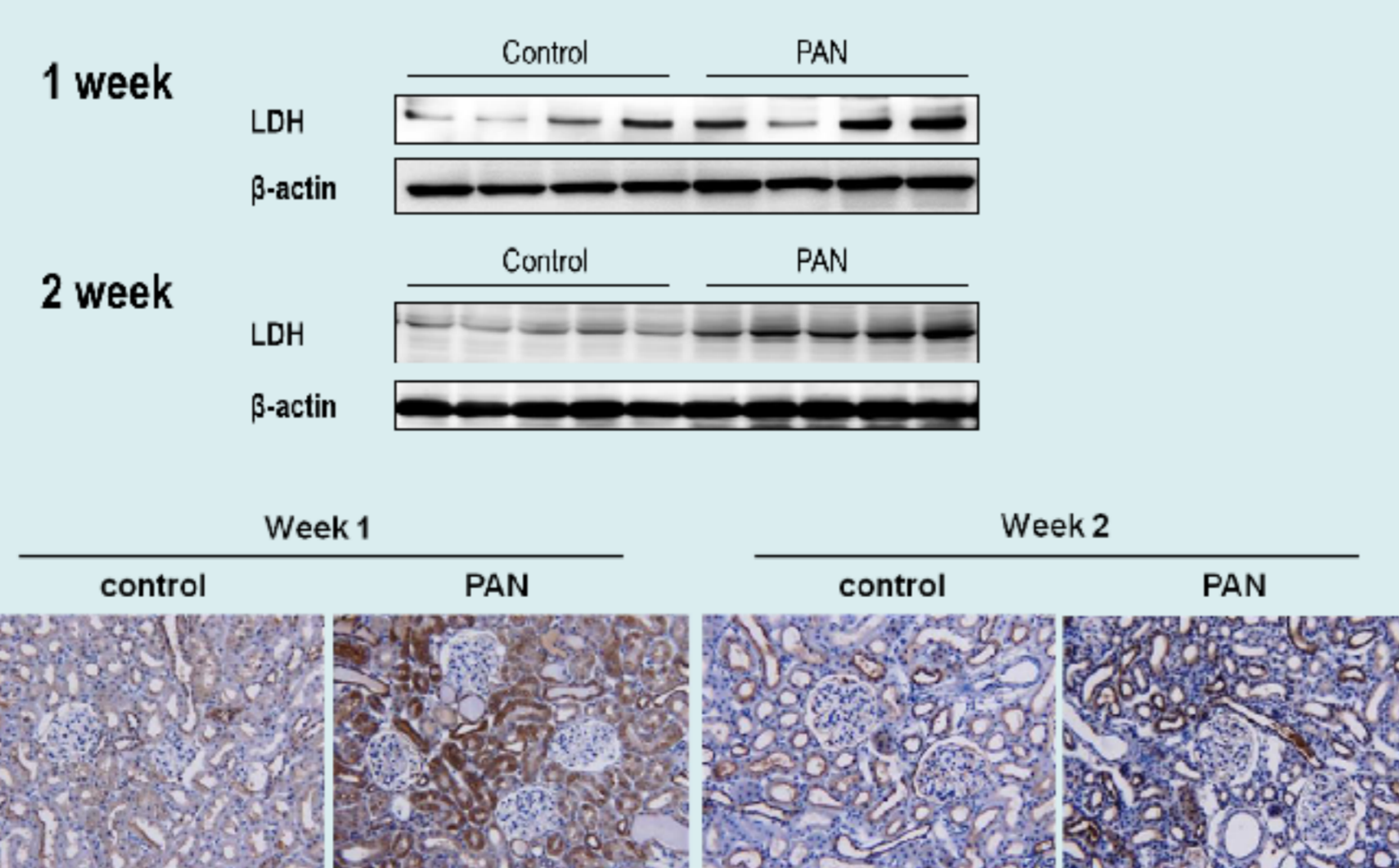
**Figure 2.** Serum LDH levels were higher in patients with decreased eGFR. \*p < 0.05 vs. control group. #p < 0.05 vs. moderate proteinuria group.



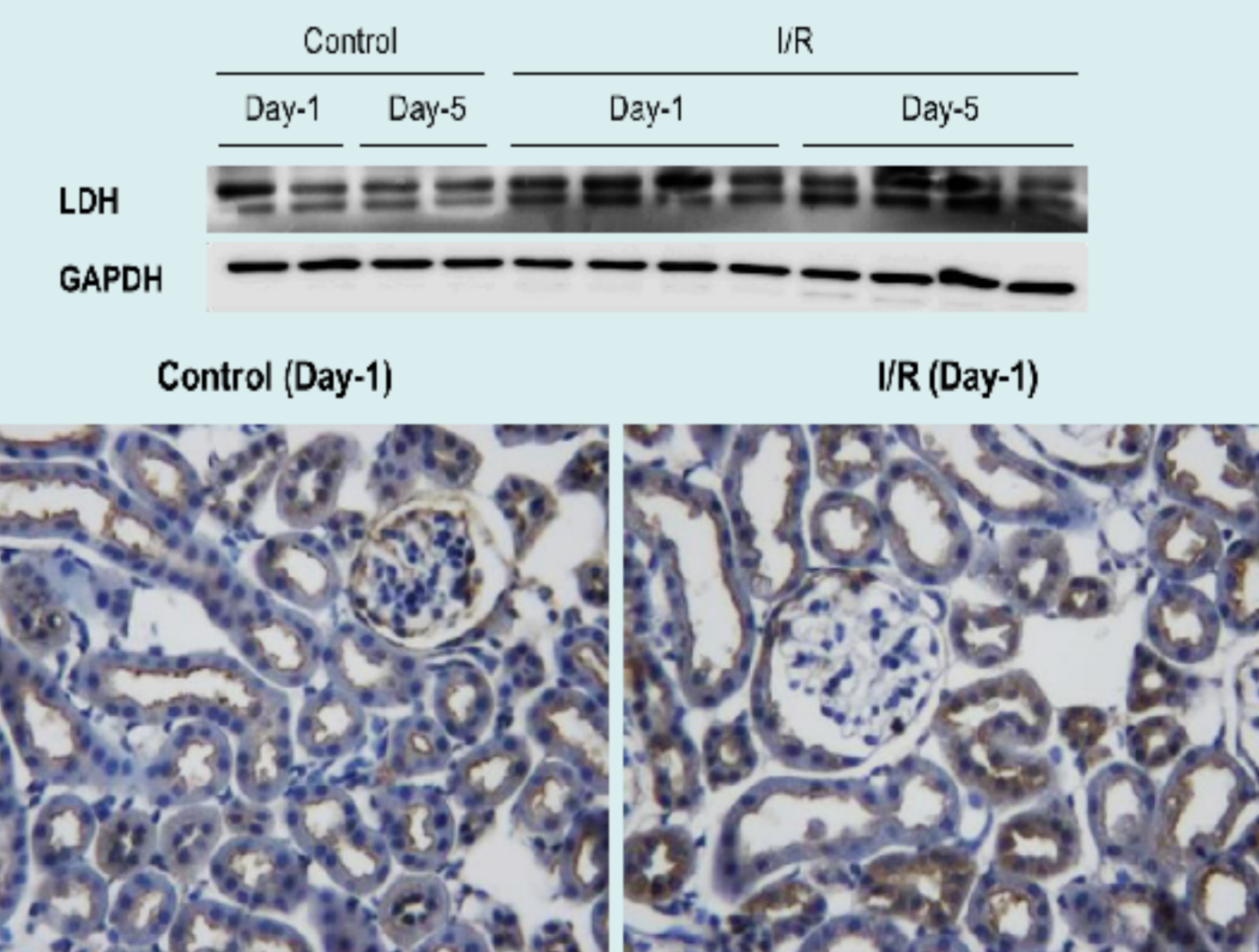
**Figure 3.** Serum LDH levels were correlated with proteinuria and serum albumin.



**Figure 4.** Serum LDH levels were correlated with BUN, serum creatinine, and eGFR.



**Figure 5.** The protein expression of LDH was increased in the kidney of rats with PAN-induced nephrotic syndrome.



**Figure 6.** The protein expression of LDH was increased in the kidney of mice with renal I/R injury.

## Conclusion:

- Serum LDH level is increased in patients with decreased eGFR and severe proteinuria, which may be attributed to increased renal expression of LDH during renal injury.

