THE FIRST MORNING URINE SAMPLE IS NOT APPROPRIATE FOR THE EVALUATION OF PROTEINURIA

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Objectives:

Proteinuria and albuminuria are early signs of chronic renal disease and important risk factors for its progression. On the basis of the results of epidemiological studies, the first morning urine sample analysis is recommended for screening purposes in adult population with risk factors for chronic kidney disease.
The aim of this prospective study was to evaluate which urine sample is the most appropriate for the evaluation of glomerular, tubular and total proteinuria, if compared to 24-hour proteinuria.

Methods:

Proteinuric patients with chronic glomerulonephritis were included in the study. Two days before the urine collection, physical rest was advised and the diet without meat and meat products. The first urine sample was defined as the first morning urine immediately after getting up, and the second urinary sample as the urine sample collected in the next 2 hours after getting up and staying in the uppright position. On the study day, 24-hour urine was collected as well as 3 ml urine sample of the first and second morning urine (both before vegetarian breakfast), sample at 12 a.m. (before vegetarian lunch), 3 p.m., 6 p.m. (before vegetarian dinner) and at 9 p.m. In all urine samples the ratios of protein to creatinine, albumin to creatinine, immunoglobulin G (IgG) to creatinine, alpha-1-microglobulin to creatinine and N-acetyl-β-D-glucosaminidase (NAG) to creatinine were determined.

Results:

We evaluated 20 patients, 7 women and 13 men, aged from 44.5 ± 11.3 years. IgA nephropathy was diagnosed in 9 patients, membranous nephropathy in 5, minimal-change disease in 2, lupus glomerulonephritis in 2, postinfectious glomerulonephritis in 1, and PR3-ANCA glomerulonephritis in 1 patient. Six patients had nephrotic syndrome. Their estimated glomerular filtration rate was 85.2 ± 5.2 ml/min/1.73 m^2.
The second morning urine sample was the most appropriate for the assessment of glomerular proteinuria – albuminuria (R = 0.989, p <0.001) and IgG excretion (R = 0.990, p <0.001), the sample taken at 3 p.m. for NAG (R = 0.897, p <0.001), the sample taken at 6 p.m. for alpha-1-microglobulin (R = 0.921, p <0.001), and the sample taken at 9 p.m. for total proteinuria (R = 0,997, p <0.001). Total proteinuria as well as glomerular and tubular proteinuria and enzymuria were underestimated in the first morning sample (Figure 1).

Figure 1. Ratio of urine albumin, IgG, NAG, alpha-1-microglobulin and protein in the urine sample/24-hour urine collection at different time of sample collection - median with interquartile range (25-75 percentile).
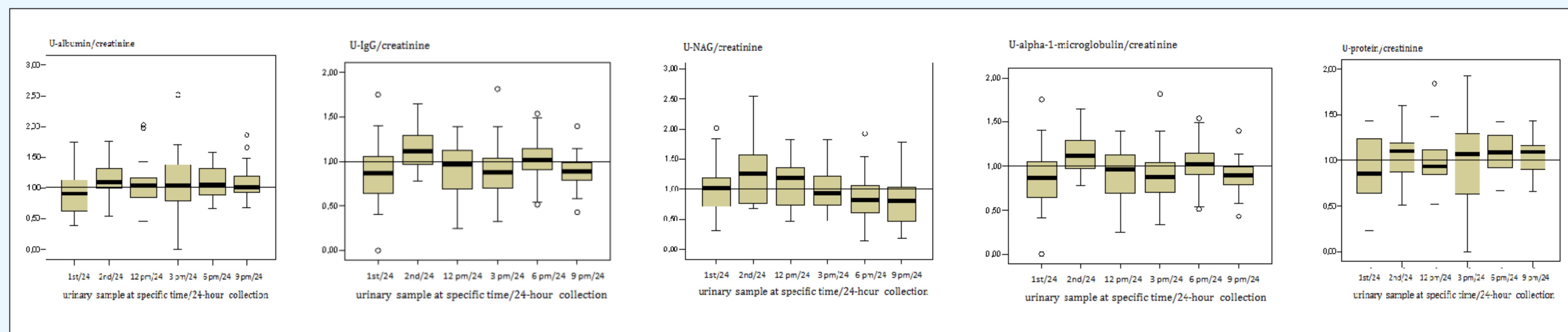
Conclusions:

In proteinuric patients with chronic glomerulonephritis the second morning urine was the most appropriate for the estimation of glomerular proteinuria, and the late evening sample at 9 p.m. the most appropriate for the estimation of overall proteinuria.
The first morning sample underestimated total proteinuria, albuminuria, excretion of IgG, NAG and alpha-1-microglobuline; therefore, its use for the screening or diagnostic purposes is questionable.

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153--SP

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