

PROGNOSTIC VALUE OF MICROALBUMINURIA IN THE DEVELOPMENT OF DIABETIC NEPHROPATHY

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Introduction. Diabetic nephropathy (DN) is one of the leading causes of end-stage renal disease (ESRD) worldwide. Early diagnosis of the disease is crucial in preventing its progression. Microalbuminuria is considered one of the earliest signs of diabetic nephropathy, and its prognostic significance is studied in this thesis.

Research Objective. The objective of this study is to determine the prognostic significance of microalbuminuria in the development of diabetic nephropathy, assess its role in the early stages of the disease, and explore the potential of using this biomarker in predicting the course and prognosis of the disease.

Materials and Methods. This study involved 200 patients diagnosed with type 2 diabetes mellitus. The patients were monitored for one year, utilizing the following modern and conventional diagnostic methods:

Microalbuminuria detection: Modern methods: Urinary albumin excretion was assessed using highly sensitive enzyme-linked immunosorbent assay (ELISA) and nephelometric methods.

Conventional method: Microalbuminuria was detected using the immunoturbidimetric assay.

Renal function assessment: Glomerular filtration rate (GFR) was calculated using the CKD-EPI formula, with additional evaluation of cystatin C levels.

Blood tests: Creatinine, blood glucose, glycated hemoglobin (HbA1c), cystatin C, and blood pressure levels were measured.

Statistical analysis: The correlation between microalbuminuria and DN progression was evaluated using Cox regression analysis and Kaplan-Meier survival curves. Results were considered statistically significant at $p < 0.05$.

Research Findings: Among the 200 patients, 120 (60%) had microalbuminuria, of whom 85 (70.8%) progressed to advanced diabetic nephropathy within one years. In contrast, only 15 out of 80 (18.7%) patients without microalbuminuria developed advanced DN ($p < 0.001$).

Among 100 patients tested using ELISA and nephelometry, 75 had microalbuminuria, and 65 of them (86.7%) demonstrated DN progression. Meanwhile, among 100 patients tested using the conventional immunoturbidimetric method, 55 had microalbuminuria, and 35 of them (63.6%) progressed to DN.

Modern ELISA and nephelometry methods were superior in predicting DN progression compared to the conventional immunoturbidimetric method ($p < 0.001$). Specifically, 86.7% of patients diagnosed with microalbuminuria via ELISA and nephelometry progressed to DN, compared to only 63.6% detected using the conventional method. This highlights the greater sensitivity of modern diagnostic techniques.

A significant decline in GFR was observed among patients with microalbuminuria compared to those without ($p < 0.001$). Specifically, the annual decrease in GFR was 4.5 ± 0.8 ml/min/1.73m² in patients with microalbuminuria, whereas in those without microalbuminuria, the decline was only 1.9 ± 0.5 ml/min/1.73m².

Kaplan-Meier survival analysis revealed that patients with microalbuminuria had a 2.8-

fold higher risk of progressing to early-stage renal failure (HR=2.8, 95% CI: 1.6-4.9, $p<0.05$). The median time for developing renal failure in patients with microalbuminuria was 26 months, whereas it was 42 months in those without microalbuminuria.

Cox regression analysis confirmed that microalbuminuria is an independent risk factor for predicting DN progression. Specifically, patients with microalbuminuria had a 3.5-fold higher likelihood of DN development (HR=3.5, 95% CI: 2.1-5.6, $p<0.001$), underscoring the necessity of regular monitoring of microalbuminuria in diabetic patients.

Conclusion: Microalbuminuria is recognized as an early and reliable prognostic biomarker for diabetic nephropathy. Its early detection allows for better glucose control, blood pressure management, and implementation of renoprotective therapies in diabetic patients. The study results indicate that modern ELISA and nephelometry methods are significantly more accurate in detecting microalbuminuria, enabling effective screening and timely intervention.