



Association of neutrophil-to-lymphocyte ratio with early renal dysfunction and albuminuria among diabetic patients

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Abstract

Purpose Neutrophil-to-lymphocyte ratio (NLR) was widely studied as a prognostic marker in various medical and surgical specialties, but its significance in diabetic kidney disease is not yet established.

Methods The subjects comprised 199 men aged 73 ± 11 (mean \pm standard deviation) years and 187 women aged 77 ± 10 years from a rural hospital. We examined the relationship between NLR calculated by analyzing differential leukocyte count in complete blood picture and renal function evaluated by estimated glomerular filtration rate (eGFR) using the Modification of Diet in Renal Disease Study Group equation and urinary albumin excretion (UAE).

Results NLR was negatively related to eGFR and positively related to UAE. Multiple linear regression analysis using eGFR and UAE as an objective variables, adjusted for confounding factors as explanatory variables showed that NLR ($\beta = -0.101$, $p = 0.009$) as well as age, body mass index, serum uric acid, and presence of uric acid lowering medication were significantly and independently associated with eGFR, and NLR ($\beta = 0.113$, $p = 0.031$) as well as prevalence of cardiovascular disease, systolic blood pressure, presence of antihypertensive medication, presence of antilipidemic medication, and eGFR were significantly and independently associated with UAE. The multivariate-adjusted odds ratios (95% confidence interval) of NLR for stage 3a (eGFR < 60 mL/min/1.73 m²), stage 3b (eGFR < 45 mL/min/1.73 m²), and microalbuminuria (UAE ≥ 30 mg/g Cr) were 1.90 (1.02–3.56) and 2.99 (1.28–6.98), and 1.77 (1.04–3.01), respectively. Next, to examine the consistency of the observed association between NLR and eGFR, we performed subgroup analyses. There was a significant interaction ($p = 0.006$) only between the two groups regarding antihypertensive medication (absence: $\beta = -0.272$, $p < 0.001$ and presence: $\beta = -0.029$, $p = 0.564$).

Conclusions Our data suggested that NLR might be important as a potential factor for evaluating patients with a higher degree of albuminuria among diabetic outpatients.

Keywords Neutrophil-to-lymphocyte ratio · Estimated glomerular filtration rate · Albuminuria · Renal dysfunction

Introduction

Diabetic kidney disease (DKD) is a microvascular complication of diabetes and the leading cause of end-stage renal disease (ESRD) [1] and mortality [2] among diabetic patients. DKD is clinically manifested as increased urinary albumin

excretion (UAE) starting from microalbuminuria to macroalbuminuria and eventually ESRD [3]. Approximately 30% of diabetic patients showed microalbuminuria after 15 years of disease onset and less than half develop renal nephropathy [3]. Several factors are involved in the pathophysiology of DKD, including hyperglycemia, which is very important, male gender, obesity, chronic inflammation, insulin resistance, hypertension, dyslipidemia, and polymorphisms and some genetic loci in specific genes. Management of its modifiable risk factors might help in reducing its incidence in the nearby future.

Recently, new pathways involved in the development and progression of DKD have been elucidated; many studies have demonstrated the critical role of inflammation in the

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