

Original Research Article

ASSOCIATION BETWEEN NEUTROPHIL/LYMPHOCYTE RATIO, ALBUMINURIA AND KIDNEY DYSFUNCTION IN DIABETIC NEPHROPATHY: A TEACHING HOSPITAL BASED STUDY

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ABSTRACT

Background: Diabetes mellitus's high treatment costs and associated problems have made it a global public health concern. Albuminuria, a symptom of diabetic nephropathy, is an inflammatory condition that precedes end-stage renal failure. According to recent reports, the neutrophil/lymphocyte ratio (NLR), a readily available and reasonably priced marker, may be a good indication of the state of inflammation.

Materials and Methods: This present cross-sectional, observational study was conducted in the Department of Pathology, KMC, Maharajgunj, UP and collaboration with Department of Medicine. 112 consecutive patients with T2DM diagnosed according to the American Diabetes Association criteria, attending the outpatient services of medicine department during the period from June, 2024 to November, 2024 in KMC, Maharajgunj were included.

Results: A total of 112 patients were examined in this study. For the purpose of comparing other parameters, patients were separated into two groups based on urine albumin estimation: those with diabetic nephropathy (Group-A) and those without (Group-B). There were 56 patients in the DN group. Blood urea, serum creatinine, mean age, gender, BMI, and obesity (BMI > 30) were similar in both groups, and the difference was not statistically significant ($p > 0.05$).

Conclusion: In patients with type 2 diabetes, Neutrophil/lymphocyte ratio, an inflammatory marker, can forecast their chance of developing nephropathy.

Keywords: Type 2 DM, Neutrophil/lymphocyte ratio, renal dysfunction, diabetic nephropathy.

INTRODUCTION

The prevalence of diabetic nephropathy has significantly increased due to the growing number of individuals with diabetes.^[1] Globally, the prevalence of type 2 diabetes has been rising significantly over the last few decades. According to the International Diabetes Federation (IDF), 451 million people worldwide have diabetes, and by 2045, that figure is projected to rise to 693 million.^[2] Diabetic nephropathy, which affects 20% to 40% of patients with type 2 diabetes mellitus,^[3] is the most common cause of chronic kidney disease and a metabolic illness with substantial morbidity

and mortality.^[4] Of these confirmed cases of diabetes, approximately 90% have T2DM.^[5] Patients with chronic kidney disease (CKD) have a 10–20 times higher risk of cardiovascular death from atherosclerosis than the general population due to accelerated atherosclerosis.^[6] Since an elevated leukocyte count starts a chain reaction of inflammation in the artery wall, its significance in the pathophysiology of atherosclerosis is well understood. In addition to leukocyte count, inflammatory markers like interleukin (IL)-1, IL-6, IL-8, and tumor necrosis factor- α have been connected to end organ damage in diabetes. However, their unavailability in standard clinical

practice is made worse by the test's high cost and lack of standardization. An easy-to-calculate measure of systemic inflammation is the neutrophil-lymphocyte ratio, which is calculated by dividing the neutrophil count by the lymphocyte count.^[7] As the world's diabetes capital and a resource-poor nation with few laboratory facilities, we want affordable and reliable indicators of end organ damage. More significantly, despite a recent report indicating a link between WBC count and albuminuria in type 2 diabetes, there has been limited research on the relationship between WBC count and vascular consequences of diabetes in our population.^[8,9] The current study examines the relationship between renal failure in diabetic nephropathy, albuminuria, and the neutrophil/lymphocyte ratio.

MATERIALS AND METHODS

This present cross-sectional, observational study was conducted in the Department of Pathology, KMC, Maharajgunj, UP and collaboration with Department of Medicine. 112 consecutive patients with T2DM diagnosed according to the American Diabetes Association criteria, attending the outpatient services of medicine department during the period from June, 2024 to November, 2024 in KMC, Maharajgunj were included.^[10] The study excluded patients with acute infections, hematologic or blood problems, dyslipidemia, hypertension, smoking, heart, liver, or renal ailments, as well as those taking steroids or non-steroidal anti-inflammatory medicines. To participate, signed informed consent was obtained. The proforma included information on age, sex, and length of

diabetes. The BMI was computed. Venipuncture was used to obtain blood in order to measure the following parameters: glycated hemoglobin (HbA1c), urea, creatinine, random blood sugar (RBS), neutrophil count, lymphocyte count, and neutrophil lymphocyte ratio (NLR). Albumin and creatinine levels were measured in spot pee. Proteinuria was classified based on the albumin/creatinine ratio in spot urine: Microalbuminuria: 30–300 mg/g creatinine, macroalbuminuria: >300 mg/g creatinine, and no proteinuria: <30 mg/g creatinine. Version 20 of SPSS was used for the statistical analysis. For continuous variables, data were presented as mean±standard deviation; for categorical variables, frequency and percentage. ANOVA and the independent t test were used to compare the groups. A P-value of 0.05 or less was regarded as statistically significant.

RESULTS

A total of 112 patients were examined in this study. For the purpose of comparing other parameters, patients were separated into two groups based on urine albumin estimation: those with diabetic nephropathy (Group-A) and those without (Group-B). There were 56 patients in the DN group. Blood urea, serum creatinine, mean age, gender, BMI, and obesity (BMI > 30) were similar in both groups, and the difference was not statistically significant ($p > 0.05$). Diabetes, RBS, and HbA1c duration were all higher in the DN group than in the non-DN group, and the difference was statistically significant ($p < 0.05$).

Table 1: Shows the clinical and pathological parameters of study participants.

Parameter	Group-A(N=56)	Group-B(N=56)	P-value
Age (years)	56.32 ± 12.6	51.6 ± 11.2	0.31
Gender (Male/female)	40/16	36/20	0.52
Duration of diabetes in years	10.2 ± 2.3	4.6 ± 1.4	0.03
Waist circumference (cm)	88.7±13.02	88.6 ± 13.12	0.23
BMI (kg/m ²)	28.2 ± 6.4	27.4± 5.3	0.14
Obesity (BMI > 30)	18 (32.14%)	08 (14.3%)	0.02
RBG (mg/dl)	181.4 ± 26.3	154.6 ± 16.6	0.01
HbA1c (%)	8.6 ± 1.9	7.8 ± 1.4	0.01
Blood urea (mg/dl)	29.6 ± 10.2	24.4 ± 8.4	0.001
Serum creatinine (mg/dl)	1.02 ± 0.4	1.01 ± 0.3	0.18
WBC count (x10 ³ /mm ³)	8.6 ± 2.9	8.1 ± 2.02	0.01
Neutrophil count (× 10 ⁹ /l)	5.3 ± 1.6	4.3 ± 1.2	0.004
Lymphocyte count (× 10 ⁹ /l)	1.5 ± 0.5	2.6 ± 0.7	0.02
Neutrophil/lymphocyte ratio (NLR)	2.75 ± 0.82	1.86 ± 0.64	0.01

DISCUSSION

The primary cause of death for patients with chronic renal disease is cardiovascular disease brought on by accelerated atherosclerosis.^[11] Diabetic nephropathy and its progression are characterized by inflammation, insulin resistance, and endothelial dysfunction.^[12] Haematological indices have been suggested as possible indicators of inflammation in diabetes in recent years.^[13] It is believed that

metabolic dysregulations such as oxidative stress, dyslipidemia, and hyperglycemia directly contribute to tissue-specific inflammation. Microalbuminuria, which deteriorates renal function, is recognized as a sign of endothelial dysfunction and a separate risk factor for cardiovascular events.^[14] Increased protein filtration and reabsorption are linked to tubulointerstitial disease and gradual loss of renal function, while glomerular injury is thought to be an early marker of DN and microalbuminuria is a

powerful signal of DN progression.^[15] Based on urine albumin measurement, we found a strong association between diabetic nephropathy and NLR in the current investigation. Other research reported similar results.^[16,17] NLR level was negatively correlated with eGFR and positively correlated with the albumin to creatinine ratio (ACR) level and the prevalence of DKD in the study by Heng Wan et al.^[18] Similarly, the positive correlation between the NLR level and greater ACR and a higher prevalence of DKD persisted in persons with normal eGFR suggests that the shift in the NLR level may begin in diabetic adults with pure proteinuria. In diabetic individuals, Kahraman C et al,^[19] looked into potential correlations between albuminuria levels, GFR, and NLR. NLR may be a practical and affordable indicator of DN because it was significantly elevated in tandem with albuminuria levels, had a negative correlation with GFR, and had a positive correlation with CRP. NLR and DN were reported to be significantly correlated by Sagar et al,^[20] suggesting that endothelial dysfunction and inflammation may play a key role in DN. According to Khandare SA et al,^[21] diabetic patients with albuminuria had a considerably greater mean NLR than those without the condition. Additionally, it was discovered that patients with albuminuria had a substantial correlation between their absolute neutrophil count (ANC) and absolute lymphocyte count (ALC) levels. PhaneeshBharadwaj's study,^[22] Patients with diabetic nephropathy had a statistically significant higher neutrophil-lymphocyte ratio than those without the condition. Additionally, there was a noteworthy correlation between NLR and those who had both diabetic retinopathy and nephropathy as opposed to those who did not. Insulin resistance and the development of diabetes mellitus (DM) are linked to chronic inflammation, which is a chronic systemic disease. Furthermore, a growing body of evidence suggests that the inflammatory response is also crucial to the onset and advancement of diabetes retinopathy and diabetic nephropathy.^[23] NLR is a mixture of two indicators, with lymphocytes representing the protective or regulating aspect of inflammation and neutrophils representing the active nonspecific inflammatory mediator starting the first line of defense.^[24] Since NLR is a good predictor of early-stage diabetic nephropathy, retinopathy, and diabetic foot ulcers, it is utilized to learn about the microvascular consequences of diabetes mellitus in terms of prognosis.^[25] These low-cost assays can be used as indicators of inflammation and for screening. Among the many drawbacks of our study were its cross-sectional design and limited sample size. To validate our findings, more studies involving a greater number of patients are required.

CONCLUSION

These findings suggest that inflammation plays a role in diabetic nephropathy. We find that in patients with type 2 diabetes, NLR, an inflammatory marker, can predict the likelihood of nephropathy. NLR levels can be a low-cost, frequently used, and precise diagnostic for the early detection of diabetic nephropathy in patients with type 2 diabetes.

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