

## INTISARI

### Hubungan Nilai *Neutrophil-to-Lymphocyte Ratio* (NLR) dengan Kejadian Tuberkulosis Paru pada Pasien Diabetes Melitus tipe 2 dengan Komplikasi Ulkus Kaki Diabetes di Rumah Sakit dr. Sardjito, Yogyakarta

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**Latar Belakang:** *Neutrophil-to-Lymphocyte Ratio* (NLR) merupakan penanda inflamasi sistemik yang mencerminkan keseimbangan antara imunitas bawaan (neutrofil) dan adaptif (limfosit). Peningkatan NLR berhubungan dengan kondisi inflamasi kronis, termasuk diabetes mellitus tipe 2 (DM tipe 2) dan komplikasinya. Pasien DM tipe 2 dengan ulkus kaki diabetes (Diabetic Foot Ulcer/DFU) memiliki risiko lebih tinggi mengalami infeksi, termasuk tuberkulosis (TB), akibat disregulasi imun akibat hiperglikemia kronis dan disfungsi sel imun (Buonacera et al. 2022a; Istiqomah, Suhariyadi & Woelansari 2024)

**Objectives:** Mengetahui hubungan antara NLR terhadap luaran TB pada pasien DM tipe 2 dengan komplikasi DFU.

**Metode:** Penelitian ini menggunakan desain kohort retrospektif dengan data sekunder dari *registry* diabetes Divisi Endokrinologi Departemen Penyakit Dalam RSUP dr. Sardjito periode Januari 2018–Desember 2023. Analisis univariat dilakukan untuk mendeskripsikan karakteristik subjek. Uji *Chi-Square* digunakan pada analisis bivariat, sedangkan regresi logistik multivariat digunakan untuk mengontrol variabel perancu seperti usia, jenis kelamin, dan komorbiditas (CKD, hipertensi, CAD, dsb). Nilai  $p < 0,05$  dianggap bermakna.

**Hasil** : Sebanyak 510 pasien DM tipe 2 dengan ulkus kaki diabetes dianalisis, terdiri dari 74 (14,5%) pasien dengan TB dan 436 (85,5%) tanpa TB. Hasil analisis bivariat menunjukkan variabel yang berhubungan signifikan dengan TB adalah usia  $\geq 60$  tahun ( $p=0,008$ ), *Chronic Kidney Disease* ( $p=0,010$ ), dan NLR tinggi  $\geq 14,53$  ( $p < 0,001$ ). Variabel lain seperti jenis kelamin, hipertensi, CAD, dan COPD tidak menunjukkan hubungan bermakna ( $p > 0,05$ ). Pada analisis multivariat, NLR tinggi ( $\geq 14,53$ ) secara independen berhubungan dengan peningkatan risiko TB (OR=17,931; 95% CI: 7,917–43,405;  $p < 0,001$ ). *Chronic Kidney Disease* (CKD) terbukti meningkatkan risiko TB secara signifikan (OR=7,641; 95% CI: 1,489–39,204;  $p=0,010$ ), sedangkan usia  $\geq 60$  tahun justru menunjukkan asosiasi bermakna dengan risiko TB yang lebih rendah (OR=0,560; 95% CI: 0,315–0,995;  $p=0,048$ ). Sementara itu, jenis kelamin laki-laki tidak menunjukkan pengaruh signifikan terhadap kejadian TB.

**Kata Kunci** : *Neutrophil-to-Lymphocyte Ratio* (NLR), Diabetes Mellitus tipe 2 (DM tipe 2), Ulkus Kaki Diabetes, Tuberkulosis Paru.

## ABSTRACT

### Correlation of Neutrophil-to-Lymphocyte Ratio (NLR) Value with Pulmonary Tuberculosis Incidence in Type 2 Diabetes Mellitus Patients with Diabetic Foot Ulcer Complications at Dr. Sardjito Hospital, Yogyakarta

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**Background:** The Neutrophil-to-Lymphocyte Ratio (NLR) is a systemic inflammatory marker that reflects the balance between innate (neutrophils) and adaptive (lymphocytes) immune responses. Elevated NLR is associated with chronic inflammatory conditions, including type 2 diabetes mellitus (T2DM) and its complications. Patients with T2DM and diabetic foot ulcers (DFU) are at a higher risk of developing infections, including tuberculosis (TB), due to immune dysregulation resulting from chronic hyperglycemia and impaired immune cell function (Buonacera et al., 2022a; Istiqomah, Suhariyadi & Woelansari, 2024).

**Objectives:** To determine the association between NLR and tuberculosis outcomes among patients with type 2 diabetes mellitus complicated by diabetic foot ulcers.

**Methods:** This retrospective cohort study utilized secondary data from the diabetes registry of the Endocrinology Division, Department of Internal Medicine, Dr. Sardjito General Hospital, Yogyakarta, from January 2018 to December 2023. Univariate analysis was performed to describe patient characteristics. Bivariate analysis was conducted using the Chi-Square test, while multivariate logistic regression was applied to control confounding factors such as age, sex, and comorbidities (CKD, hypertension, CAD, etc.). A *p*-value <0.05 was considered statistically significant.

**Results:** A total of 510 patients with type 2 diabetes mellitus and diabetic foot ulcers were analyzed, consisting of 74 patients with TB (14.5%) and 436 without TB (85.5%). Bivariate analysis showed that age  $\geq 60$  years ( $p=0.008$ ), chronic kidney disease ( $p=0.010$ ), and a high NLR  $\geq 14.53$  ( $p<0.001$ ) were significantly associated with TB, whereas sex, hypertension, CAD, and COPD were not ( $p>0.05$ ). In multivariate analysis, a high NLR ( $\geq 14.53$ ) remained independently associated with an increased risk of TB (OR=17.931; 95% CI: 7.917–43.405;  $p<0.001$ ). Chronic kidney disease also significantly elevated TB risk (OR=7.641; 95% CI: 1.489–39.204;  $p=0.010$ ), while age  $\geq 60$  years showed a significant association with a lower risk of TB (OR=0.560; 95% CI: 0.315–0.995;  $p=0.048$ ). Meanwhile, male sex did not demonstrate a significant effect on TB occurrence.

**Keywords:** Neutrophil-to-Lymphocyte Ratio (NLR), Type 2 Diabetes Mellitus (T2DM), Diabetic Foot Ulcer (DFU), Pulmonary Tuberculosis.