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# Neutrophil-lymphocyte ratio and platelet-lymphocyte ratio are 2 new inflammatory markers associated with pulmonary involvement and disease activity in patients with dermatomyositis

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ABSTRACT

*Background:* The neutrophil-lymphocyte ratio (NLR) and platelet-lymphocyte ratio (PLR) have emerged as useful biomarkers to predict systemic inflammation. However, there is no study to investigate the relationship between the biomarkers and dermatomyositis (DM).

*Methods:* Seventy-three newly diagnosed patients with DM and 147 healthy subjects were selected in this retrospective study. We divided the 73 DM patients into 2 groups: 55 without interstitial lung disease (ILD) and 18 with ILD. Complete clinical characteristics were extracted from the medical records of DM patients. The correlations between NLR, PLR, the clinical characteristics and the disease activity were analyzed.

*Results:* For DM patients without ILD, the NLR and PLR were significantly higher than those in the control group (both $P < 0.001$). For DM patients with ILD, the NLR and PLR were higher than in DM patients without ILD ($P = 0.004$ and $P = 0.026$, respectively). The NLR was positively correlated with C-reactive protein (CRP) ($r = 0.543$, $P < 0.001$) and the erythrocyte sedimentation rate (ESR) ($r = 0.513$, $P = 0.001$). The global activity scores correlated positively and significantly with NLR, PLR, and CRP ($r = 0.486$, $P < 0.001$; $r = 0.240$, $P = 0.041$; and $r = 0.343$, $P = 0.003$, respectively). Based on the ROC curve, to predict DM patients with ILD, the best cut-off value of the NLR was 3.98 (sensitivity 88.9%, specificity 52.7%, AUC = 0.727), and the best cutoff value of PLR was 221.69 (sensitivity 77.8%, specificity 69.1%, AUC = 0.722).

*Conclusions:* Both NLR and PLR exhibit favorable diagnostic performance in predicting pulmonary involvement and disease activity in patients with DM. We provide the optimal cut-off values for DM patients with ILD that would maximize the diagnostic efficiency.



## 1. Introduction

Dermatomyositis (DM) is a chronic autoimmune connective tissue disease. Muscle inflammation is the defining feature of the disease, leading to proximal muscle weakness and disability, abnormal skin lesions, ulceration, calcinosis, and malignancy [1]. Interstitial lung disease (ILD) is a common complication of DM with a reported prevalence of 19.9% to 78%, and it is a known contributor to increase morbidity and mortality of the patients [2–5]. The quality of life for DM patients is poor; thus early diagnosis and therapy of the disease is beneficial for the patient's long-term outcome.

The activity of creatine kinase (CK) is increased in approximately 70% of DM patients [6], however, it is usually normal in observably weak patients and in those with long-lasting or intense disease. Antinuclear antibodies (ANAs) were reported to be helpful in predicting clinical response to therapy and prognosis of DM patients, whereas, it was detected to be positive only in 24% to 60% of the patients [6]. Although concentrations of ferritin, anti-melanoma differentiation-associated gene 5 (MDA5) antibody, Krebs von denLungen-6 (KL-6) were used to rapidly predict ILD progression and respiratory failure in DM patients, these biomarkers were not simple, measurable and economical, preventing the use of them in the clinical practice [7,8].

Recently, the neutrophil-lymphocyte ratio (NLR) and platelet-lymphocyte ratio (PLR) have emerged as useful biomarkers to predict systemic inflammation [9–11]. Therefore, many studies have shown that NLR as well as the platelet-lymphocyte ratio (PLR), another parameter derived from a routine complete blood count (CBC), are positively associated with inflammation, many cancers, cardiovascular disease, and diabetic nephropathy [12–15]. Moreover, measurements of the two

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biomarkers are inexpensive and easily performed in clinical laboratories. However, there is no study to investigate the relationship between the biomarkers and DM.

## 2. Materials and methods

### 2.1. Ethics approval

The study was approved by the Human Research Ethics Committee of the Second Affiliated Hospital of Nanchang University. Written informed consents were obtained from all subjects.

### 2.2. Study population

One hundred eighty eight candidate patients and 147 age and sex-matched healthy subjects without any risk factors or chronic diseases were assessed in this study. All of them were collected in accordance with the inclusion and exclusion criteria (Fig. 1) from the Second Affiliated Hospital of Nanchang University between January 2011 and May 2016. All patients were newly diagnosed and hadn't received treatment and 18 of the cases had ILD. The diagnosis of DM was based on the established international criteria of Bohan et al. [16–19]. The diagnosis of ILD was based on typical HRCT scan findings [20]. Patients who had acute or chronic infection, hematologic disorders, various malignancies, acute poisoning, chronic obstructive pulmonary disease, thrombus formation, diabetic nephropathy, or treatment with corticosteroids or immunosuppressants were excluded from the study. The control group consisted of randomly selected subjects who visited the Second Affiliated Hospital of Nanchang University for a health check-up and had no evidence of illness during the same period.

### 2.3. Laboratory data extraction

Patient characteristics and clinical and laboratory data measured for each patient included age and sex, creatine kinase (CK), creatine kinase-MB (CK-MB), lactate dehydrogenase (LDH), albumin (ALB), alanine transaminase (ALT), creatinine (Cr), C-reactive protein (CRP), erythrocyte sedimentation rate (ESR), anti-nuclear antibodies (ANAs), ferritin (FER), and white blood cells (WBC). On admission, fasting blood samples were collected from the antecubital vein for the routine biochemical tests (Beckman Coulter 5400) and CBC parameters (Sysmex XE-2100) in the morning. All the measurements were performed within 2 h following blood collection. The absolute neutrophil count divided by the absolute lymphocyte count was regarded as NLR, and the absolute platelet count divided by the absolute lymphocyte count was PLR.

### 2.4. Assessment of dermatomyositis activity

The Myositis Disease Activity Assessment Tool (MDAAT) is a comprehensive means of evaluating global and extra-muscular disease activity [21,22]. This study utilized separate 100 mm Visual Analogue Scales (VAS) from the MDAAT scores of 6 different systems (constitutional, skeletal, cutaneous, gastrointestinal, pulmonary, and cardiovascular) to gauge the physician's evaluation of disease activity [21]. The global VAS scores of the six systems were combined as an indicator of overall disease activity [22].

### 2.5. Statistical analysis

Data statistics were performed using SPSS 19.0 (SPSS for Windows, ver. 19.0). The normality of data distribution was checked by the Kolmogorov-Smirnov test. Quantitative variables were presented as mean ± SD or median (25th–75th percentile), and categorical variables were

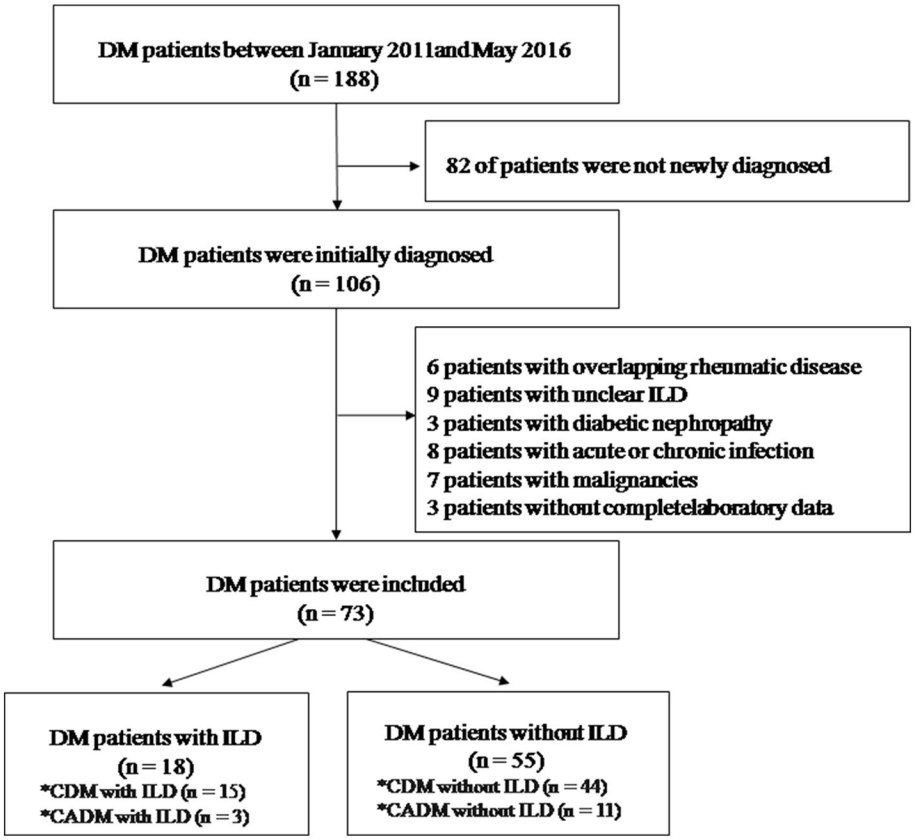


**Fig. 1.** Diagnostic flow chart for patients with dermatomyositis (DM). ILD, interstitial lung disease; CDM, classic dermatomyositis; CADM, clinically amyopathic dermatomyositis.