

## Diagnostic Value of Neutrophil Lymphocyte Ratio in Allergy Patients

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### ABSTRACT

**Objectives:** We aimed to investigate the relationship between the neutrophil/lymphocyte ratio (NLR) and clinical characteristics of acute allergic reaction patients diagnosed in an emergency clinic

**Material and methods:** The medical records of the patients with a diagnosis of acute allergic reaction that presented to Dicle University Medical Faculty Hospital Emergency Department between January 1, 2014 and December 31, 2014 were included in the study. The age, gender, NLR, white blood count, eosinophil, MPV, glucose, and platelet count of all participants were recorded. The study included 100 allergy patients and 100 healthy controls. The demographic and the clinical characteristics of the groups were compared by statistical analysis.

**Results:** The mean age, gender, lymphocyte count, eosinophil count, platelet count, and MPV were similar in the two groups ( $p > 0.05$  for all). The mean NLR values of the allergy and the control group were 4.36 and 2.12, respectively ( $p = 0.008$ ). Moreover the serum glucose levels were significantly higher in allergy group compared to the control group ( $p < 0.001$ ).

**Conclusions:** Patients with acute allergic reaction had a significantly higher value of NLR. Thus, NLR may be a useful diagnostic indicator of allergic conditions.

**Keywords:** Allergy, inflammation, neutrophil/ lymphocyte ratio

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### INTRODUCTION

An allergy is a special type of severe reaction involving antibody and/or cell-mediated immune mechanisms. It generally occurs in response to non-pathogenic substances. The severity of allergic reaction may vary depending on the dose of allergen involved, the allergen's route of entry into the body, the presence of additional environmental microorganisms, and the individual's genetic composition (1). Most allergic and inflammatory diseases derive from IgE-mediated mechanisms. After various studies had shown that neutrophilic inflammation was associated with severity of asthma, research began on neutrophil migration to the region of inflammation. Recent studies have shown that that cytokine IL-17 released from Th 17 cells plays a significant role in neutrophilic inflammation. Studies using animal models have shown that Th17 cells, together with Th2 cells, cause neutrophilic inflammation and excessive airway sensitivity (2, 3).

Neutrophils and lymphocytes are blood cells with important roles in inflammatory events. Changes in the numbers of these cells may be observed during inflammation. When an allergen is encountered, neutrophils are the first inflammation cells to migrate to the area of inflammation. Produced in bone marrow and short-lived, neutrophils migrate to the area of inflammation by entering the circulation in approximately one hour (4). This results in a rise in the number of neutrophils in blood. The neutrophil lymphocyte ration (NLR) has been described as a prognostic factor and marker of inflammation in various diseases, such as cardiovascular diseases (5, 6) and cancers (7) However, the manner in which the NLR changes in allergies, another inflammatory condition, is not known.

Since there are no previous studies on this subject, the purpose of this study was to investigate the association between NLR and progression of disease in cases of acute allergic reaction.

## **MATERIALS AND METHODS**

Medical records of patients presenting to the Dicle University Medical faculty Research Hospital Emergency Department between January 1 and December 31, 2014 who developed systemic or local acute allergic symptoms for any reason (such as skin reddening, swelling, itching, urticaria, eczema, angioedema, swollen throat, respiratory difficulty, sneezing, coughing and watery eyes, or nausea, vomiting, pain and diarrhoea involving the gastrointestinal system) were examined retrospectively. The study was performed in accordance with the Helsinki Declaration, and the Dicle University Medical Faculty Non-Interventional Clinical Research Ethical Committee granted approval (25.11.2014, no. 2014/415). A control group was established by examining the file records of healthy volunteers who had donated blood to the blood bank.

Demographic data, such as age and gender and laboratory data including NLR, lymphocyte, eosinophil, MPV, glucose and platelet values were recorded. Patients with any systemic or local disease (with the exception of acute allergic reaction), infection, or clinical conditions that might affect full blood parameters were excluded from the study. NLR was calculated based on haemogram results for all patients.

Haemograms (Mean platelet volume (MPV), platelets, lymphocytes, monocytes, basophils, neutrophils and eosinophils) were investigated on an Abbott CELL DYN 3700 (USA) device. Biochemical parameters (glucose) were investigated using the colorimetric method with an Abbott kit on an Abbott C16000 device.

“Statistical Package for the Social Sciences 18” software (SPSS Inc, Chicago IL, USA) was

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used for statistical analysis. Student's *t*-test was used for normally distributed data as identified by the Kolmogorov-Smirnov test. The Mann Whitney U test was used for non-normally distributed data. The Chi-squared test was performed for categoric comparisons.

### RESULTS

One hundred patients with acute allergy and 100 control cases were evaluated. The male/female ratio was 40:60 in the allergy group and 47:53 in the control group ( $p = 0.28$ ). Groups' demographic and laboratory characteristics are summarized in (Table 1). Neutrophil numbers and NLR were significantly higher in the acute allergy group in our study compared to the control group. Blood glucose levels were also significantly higher in the group diagnosed with allergic diseases compared to the control group.

Table 1. Comparison of the clinical and demographic parameters among the patient and control groups

	<b>Allergy (n = 100)</b>	<b>Control (n = 100)</b>	<b><i>p</i></b>
<b>Age (Year <math>\pm</math> SD)</b>	41.2 $\pm$ 16.9	38.4 $\pm$ 14.5	0.23
<b>Male/Female (n)</b>	40/60	47/53	0.28
<b>Neutrophils (K/uL)</b>	6.66 $\pm$ 3.80	4.65 $\pm$ 2.03	< 0.001
<b>Lymphocytes (K/ul)</b>	2.41 $\pm$ 1.22	2.48 $\pm$ 1.43	0.73
<b>NLR</b>	4.36 $\pm$ 8.24	2.12 $\pm$ 1.07	0.008
<b>Eosinophils (K/ul)</b>	0.22 $\pm$ 0.33	0.28 $\pm$ 0.75	0.44
<b>Glucose (mg/dL)</b>	119.2 $\pm$ 50	99.1 $\pm$ 28	< 0.001
<b>MPV (fL)</b>	8.72 $\pm$ 1.89	8.80 $\pm$ 1.59	0.74
<b>Platelet (10<sup>3</sup>K/uL)</b>	272.7 $\pm$ 77.0	293.78 $\pm$ 94.6	0.85

**NLR:** neutrophil lymphocyte rate, **MPV:** mean platelet volume.

## DISCUSSION

Our scan of the literature revealed no previous investigations of the NLR in cases of acute allergy. Neutrophil numbers and NLR were significantly higher in the acute allergy group in our study compared to the control group. Blood glucose levels were also significantly higher in the group diagnosed with allergic diseases compared to the control group.

The use of the NLR as a marker of inflammation has become increasingly popular. One study reported a higher NLR in young patients with acute coronary syndrome with no ST elevation compared to a control group (8). Another study revealed no significant difference of NLR between coronary artery disease patients with weak collateral circulation and patients with well developed coronary collateral circulation (9). In cases of tuberculous pleurisy, in which inflammation is involved, investigation of pleural fluid adenosine deaminase activity and NLR has been reported to make a significant contribution to diagnosis (10). In addition, one study reported higher NLR values in patients with psoriasis compared to a control group (11). The significance of NLR in our study derives from the significant change in neutrophil numbers ( $p < 0.001$ ), because no significant change was observed in lymphocyte numbers ( $p = 0.73$ ).

Studies have reported an increase in neutrophil and eosinophil numbers toward the late phase after rapid response in allergic reactions (1). Neutrophil numbers in blood collected from the veins of patients at presentation to our emergency clinic were significantly higher in the acute allergy group compared to the control group. This may be attributed to neutrophil infiltration in the acute period.

An increase in eosinophil numbers has been reported in allergic reactions. However, since the IL-4 pathway is activated in allergic reactions in association with drugs and non-helminthic agents, no significant change is observed in eosinophil levels.

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Neutrophil lymphocyte ration has been used as an inflammatory marker in studies on various diseases. An inflammatory process is involved in allergy cases. Neutrophil lymphocyte ration levels were significantly higher in allergy patients than in the control group in our study. Significant NLR elevation resulted from an increase in neutrophil numbers. Since allergic reactions are generally type 1 hypersensitivity reactions, an increase in lymphocyte numbers in the early period is not generally expected in these cases.

Allergies and stress in the body also cause an increase in glucose levels. Blood glucose levels can change in patients with a diagnosis of acute allergic reaction, due to anaphylaxis-related stress and steroid therapy. This may account for the elevated blood glucose levels in the allergy group compared to the control group in our study.

In conclusion, the significantly high NLR in acute allergic reaction cases in this study suggests that it may be a useful diagnostic parameter in allergic reactions. Prospective randomized clinical studies with larger case numbers are now needed to examine the association with parameters that can affect NLR.

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