The Role of Mean Platelet Volume as an Inflammatory Marker in Children with Allergic Rhinitis

S Kutluğ[1], A Söğüt[2], R Sancak[3], Ş Paksu[4], E Günbey[5], R Karli[5], N Murat[6]

ABSTRACT

Objective: Mean platelet volume (MPV) is a potential marker of platelet reactivity. Increased MPV levels are shown to be the predictor of inflammation. The aim of this study was to investigate whether MPV is an inflammatory indicator in children with allergic rhinitis.

Methods: The study included 44 children with allergic rhinitis between the ages of six and 18 (47.1% boys), and 45 healthy children between the ages of six and 18 (52.9% boys), and the MPV, PLT, WBC, Hb values in their haemograms were compared.

Results: No differences were found between the allergic rhinitis group and the healthy control group in terms of age and gender (p = 0.15 and 0.60, respectively). While the mean platelet volume (MPV) value of the patient group was 6.9 fL (6–9), the MVP value of the control group was 7.0 fL (5.9–9.7). There was no statistically significant between the patient and control groups in terms of MPV values (p = 0.15). In addition, there were no differences between the patient and control groups in terms of platelet count, leukocyte count, or haemoglobin values (p = 0.09, 0.55 and 0.22, respectively).

Conclusion: To the best of our knowledge, this is the first study to analyze the role of MPV as an inflammatory indicator in children with allergic rhinitis. According to our results, MPV can not be used as an indicator of inflammation in patients with allergic rhinitis.

Keywords: Allergic rhinitis, children, inflammation, mean platelet volume

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From: [1]Pediatrics, Pediatric Allergy and Immunology, [2]Pediatric Allergy and Immunology, [3]Pediatric Allergy and Immunology, [4]Department of Pediatrics, [5]Department of Otorhinolaryngology, Faculty of Medicine, Samsun, Turkey, Ondokuz Mayis University and [6]Faculty of Engineering, Industrial Engineering , Samsun, Turkey.

Correspondence: Dr S Kutluğ, Pediatrics, Pediatric Allergy and Immunology, Faculty of Medicine, Samsun, Turkey, Ondokuz Mayis University.

INTRODUCTION

Rhinitis is the inflammation of the nasal epithelium. The diagnosis of allergic rhinitis can be established by the presence of at least two of the following symptoms in the absence of common cold or influenza: nasal congestion, nasal itching, runny nose and sneezing. Anterior rhinoscopy and allergy tests may help physicians to confirm the diagnosis (1). Allergic rhinitis is a common problem in children and adolescents (2) with a prevalence of 14.6% in adolescents (3). Allergic rhinitis has been shown to cause chronic allergic inflammation of the upper respiratory tract and hypertrophy of lymphoid tissue (1, 4).

Platelets are known to participate actively in both allergic and non-allergic types of inflammation (5, 6). Some mediators secreted by platelets lead to histamine release from mast cells and basophils, and thus cause platelet activation (6, 7). More recently, as well as increases in platelet count as a result of platelet activation, increases in platelet distribution width (PDW) and mean platelet volume (MPV) have been shown in routine blood counts (8).

Mean platelet volume is considered a marker and determinant of platelet function since larger platelets are hemostatically more reactive than platelets of normal size, increasing the propensity to thrombosis (9).

There are studies in the literature identifying a decrease in MPV in some diseases that involve chronic inflammation, such as inflammatory bowel disease, rheumatoid arthritis, ankylosing spondylitis and Henoch-Schönlein purpura (10–12). In children, a decrease in MPV has been shown in the inflammation of some chronic diseases such as cystic fibrosis and familial Mediterranean fever (13, 14). In several studies, MPV and acute phase reactants were compared and MPV was found to be a negative acute phase reactant (15, 16). In contrast, other studies found a MPV increase in some metabolic diseases, and in chronic urticaria (17–19).

Mean platelet volume has been studied as an inflammatory marker in children with asthma (16, 20) and chronic idiopathic urticaria (21). The relationship between MPV and allergic rhinitis has not been studied before. The aim of this study was to investigate whether MPV is an inflammatory indicator in children with allergic rhinitis.

SUBJECTS AND METHODS

Study Group and Measurements

This study included patients diagnosed with allergic rhinitis at the Children's Allergy and Immunology Clinic at Ondokuz Mayıs University's Faculty of Medicine between April 2014 and October 2014. Forty-four newly diagnosed allergic rhinitis patients aged six to 18 were recruited for the study. All patients were in an active symptomatic period. Patients with asthma, acute infection, chronic inflammatory or haematologic disorders, and those who had been receiving nasal steroid therapy or oral antihistamines for allergic rhinitis during the previous three months, were excluded from the study. Ethics committee approval was granted by the Ondokuz Mayis University's Ethics Committee of Medical Research. The written informed consent was obtained from the parents of all the participants.

Venous blood samples were taken from all patients for the hemogram and to measure total IgE levels. All patients underwent a skin-prick test. The following antigens were tested: a mixture of trees, grass, and weeds, Alternaria alternata, Aspergillus fumigatus, Dermatophagoides farinae, Dermatophagoides pteronyssinus, cat hair, feathers, and cockroach. According to the serum physiological response, an induration of three or more millimeters was considered significant. Serum IgE levels greater than 120 IU/mL were considered significant. An eosinophil level greater than 4% was considered significant. The control group included 45 healthy, age and gender-matched children. Haemograms were also taken from the healthy

controls. Both groups were compared with respect to complete blood count, platelet count (PLT), mean platelet volume (MPV), the number of white blood cells (WBCs), and haemoglobin (Hb) levels.

Statistical analysis

Data were analysed using an IBM SPSS V.20 program (Chicago, USA). A Kolmogorov-Smirnov test was used to determine whether the data were normally distributed. While comparison of normally distributed data was performed with independent two-sample *t*-test, those not showing normal distribution were analysed using the Mann-Whitney U test. A Chi-squared test was used for the comparison of the qualitative data. Data were presented as mean ± standard deviation, median (min-max) and n (%). A *p*-value of < 0.05 was considered significant.

RESULTS

The median ages in the patient and control groups were 12.5 years (min–max: six to18) and 12.0 years (min–max: five to18), respectively. The male/female gender ratio was 47.1% in the patient group and 52.9% in the controls. There were no significant differences between groups with respect to age and gender: *p*-values were 0.15 and 0.60, respectively (Table 1). While median MPV value was 6.9 fL in patients (min-max: 6–9), it was 7.0 fL (min–max: 5.9–9.7) in controls. No difference was observed between patient and control groups in terms of MPV value ($p = 0.15$). In addition, there were no significant differences between the two groups with respect to platelet count, white blood cell count, and haemoglobin levels: *p*-values were 0.09, 0.55 and 0.22, respectively (Table 2).

Table 1. Demographic data of the study group

	Study group (n = 44)	**Control group** (n = 45)	***p***
Age (year) median (min-max)	12.5 (6–18)	12.0 (5–18)	0.15
Male (%)	47.1	52.9	0.60

Table 2. Comparison of the laboratory values of patients with allergic rhinitis and healthy controls

Parameters	**Allergic rhinitis group**	**Control group**	***p****
MPV (fL)	6.9	7	0.15
Median (min-max)	(6–9)	(5.9–9.7)	
PLT (x10^3/µL)	294.000	310.000	0.09
Median (min-max)	(192.000–509.000)	(143.000–574.000)	
WBC (x10^3/µL)	7300	7430	0.55
Median (min-max)	(4510–15360)	(4130–14030)	
Hb (g/dL)	13.18 ± 1.27	12.86 ± 1.18	0.22
(Mean ± SD)			

*$p < 0.05$ statistically significant. MPV: Mean platelet volume, WBC: White blood cell count, PLT: Platelets, Hb: Haemoglobin

DISCUSSION

The current study is the first study investigating MPV, one of the platelet activation markers, in children with allergic rhinitis. Platelets lead to the aggregation of inflammatory cells in allergic inflammation (5). Platelet count, MPV, PDW, platelet aggregation, thromboglobulin, platelet factor-4 and P-selectin levels can be used to identify the platelet activation (8, 19, 22).

In this study, we used platelet count and MPV values in routine blood counts to identify the platelet activation.

Tuncel *et al*, compared the MPV values of 100 asthmatic children (mean age 8.2 years) in both exacerbation and asymptomatic periods with those of healthy controls and found no difference (20). They also compared their C-reactive protein (CRP) levels in exacerbation and stable periods and found no significant difference. Consequently, researchers have suggested that MPV can not be used as a marker in inflammatory asthma. Similarly, we compared MPV levels in children with allergic rhinitis with those in healthy controls and found no difference.

Sun *et al*, found higher CRP and lower MPV in patients having asthma attacks in comparison to controls. Also, when compared to healthy controls, MPV was significantly lower in stable asthmatic patients (16). Kowal *et al* demonstrated increases in beta-thromboglobulin (beta-TG), platelet factor-4 (PF-4), and P-selectin levels in 33 asthmatic patients, and decreases in platelet count; however, MPV levels were not included in their study (23). Kasperske-Zajac *et al,* investigated platelet activation markers including platelet count, PF-4, beta-TG, in patients with persistent allergic rhinitis (aged 18–35) and compared these values with those of both healthy controls and adults with mild asthma and persistent allergic rhinitis. They found no difference between the three groups [values were within the normal range] (22). In our study, platelet counts in patients with allergic rhinitis were similar to those in healthy controls.

Different results were obtained in studies of different allergic diseases. In adults with atopic dermatitis (AD), PF-4 and beta-TG levels were found to be higher than those in healthy controls and these high levels have been decreased by means of AD treatment (24, 25). In a study investigating platelet activation markers in children with chronic urticaria, MPV levels were found to be lower in comparison to healthy controls, while platelet counts were found to be significantly higher (21). Different MPV results were obtained in studies involving adults with chronic urticaria. Although some studies indicated an increase in MPV values (19, 26), others reported that MPV levels were stable in urticaria (27).

In a study involving adult allergic rhinitis patients, platelet counts were found to be within the normal ranges (22). However, they did not investigated the MPV. In our study, platelet counts was similar between patient group and healthy group.

The most important limitation of our study was that we did not investigate other platelet markers. Therefore, children with allergic rhinitis should be studied further.

In conclusion, the MPV and platelet counts in children with allergic rhinitis are similar to those in healthy controls. It can therefore be concluded that MPV cannot be used as an inflammatory marker in children with allergic rhinitis. However, studies involving more series are needed to reach a definitive conclusion on this issue.

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