ORIGINAL ARTICLE

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

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ABSTRACT

Objective: *The mean platelet volume (MPV) is a potential marker of platelet reactivity. Increased MPV levels are shown to be the predictors of inflammations. 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 6 and 18 years (47.1% boys), and 45 healthy children between the ages of 6 and 18 years (52.9% boys), and the MPV, platelet (PLT), white blood cell (WBC), haemoglobin (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 their age and their gender (*p *= 0.15 and 0.60, respectively). While the 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 difference between the patient and the control groups in terms of their MPV data (*p *= 0.15). In addition, there were no differences between the patient and control groups in terms of PLT count, WBC count, or Hb data (*p *= 0.09, 0.22, and 0.22, respectively).*

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

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

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 the 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 the cells and basophils, and thus cause platelet activation (6, 7). More recently, increases in platelet count as a result of platelet activation and increases in platelet distribution width (PDW) and mean platelet volume (MPV) had been shown in routine blood counts (8). The MPV is considered a marker and

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a 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 which had reported a decrease in MPV in some diseases that involved chronic inflammation, such as inflammatory bowel disease, rheumatoid arthritis, ankylosing spondylitis and Henoch–Schönlein purpura (10–12). In children, a decrease in MPV had been shown in the inflammation of some chronic diseases such as cystic fibrosis and familial Mediterranean fever (13, 14). In numerous 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 an MPV increase in some metabolic diseases and in chronic urticaria (17–19).

The MPV had been studied as an inflammatory marker in children with asthma (16, 20) and chronic idiopathic urticaria (21). The relationship between MPV and allergic rhinitis had 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, Turkey, between April 2014 and October 2014. Forty-four newly diagnosed allergic rhinitis patients aged 6 to 18 years were recruited for the study. All the patients were in an active symptomatic period. The 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 3 months, were excluded from the study. The 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 the patients for the haemogram and to measure their total immunoglobulin E (IgE) levels. All the 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 3 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), MPV, the number of white blood cells (WBCs), and haemoglobin (Hb) levels.

Statistical analyses

The data were analysed using an IBM SPSS V.20 program (Chicago, IL, USA). A Kolmogorov–Smirnov test was used to determine whether the data were normally distributed. While the 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-square test was used for the comparison of the qualitative data. The data were presented as means ± standard deviations, median (min–max) and n (%). A p-value of < 0.05 was considered statistically significant.

RESULTS

The median ages in the patient and control groups were 12.5 years (min–max: 6–18) and 12.0 years (min–max: 5–18), respectively. The male to female gender ratio was 47.1% in the patient group and 52.9% in the control group. There were no significant differences between the groups with respect to their age and gender: p-values were 0.15 and 0.60, respectively (Table 1). While the 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 statistically significant difference was observed between the 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 the PLT count, the WBC count, and the Hb levels: p-values were 0.09, 0.55, and 0.22, respectively (Table 2).

DISCUSSION

The current study was the first to investigate MPV, one of the platelet activation markers, in children with allergic rhinitis. The 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.

Table 1: Demographic data of the study groups

	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) Median (min–max)	6.9 (6–9)	7 (5.9–9.7)	0.15
PLT (× 10^3/μL) Median (min–max)	294 000 (192 000–509 000)	310 000 (143 000–574 000)	0.09
WBC (× 10^3/μL) Median (min–max)	7300 (4510–15 360)	7430 (4130–14 030)	0.55
Hb (g/dL) (Mean ± SD)	13.18 ± 1.27	12.86 ± 1.18	0.22

*$p < 0.05$ statistically significant.
MPV = mean platelet volume; WBC = white blood cell count; PLT = platelet; Hb = haemoglobin.

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 the 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, research studies have suggested that MPV cannot be used as a marker in inflammatory asthma. Similarly, we compared MPV levels in the children with allergic rhinitis with those in the healthy controls and found no difference. Sun *et al* found higher CRP and lower MPV in patients having asthma attacks in comparison with the patients in the control group. Also, when compared with the healthy controls, MPV was significantly lower in the stable asthmatic patients (16). Kowal *et al* demonstrated the increases in beta-thromboglobulin (beta-TG), platelet factor-4 (PF-4) and P-selectin levels in 33 asthmatic patients, and the decreases in platelet count; however, MPV levels were not included in their study (23). Kasperska-Zajac *et al* investigated platelet activation markers, including platelet count, PF-4 and beta-TG, in patients with persistent allergic rhinitis (age 18–35 years) 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) (24). In our study, platelet counts in patients with allergic rhinitis were similar to those in the healthy control group.

Different results were obtained in the 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 the healthy control groups and these high levels were decreased by means of AD treatment (24, 25). In a study investigating platelet activation markers in children with chronic urticaria, the MPV levels were found to be lower in comparison with those of healthy control group, while the 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 the MPV values (19, 26), others reported that the 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 investigate the MPV. In our study, platelet counts were 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.

CONCLUSION

The MPV and platelet counts in children with allergic rhinitis were similar to those in the healthy control group. 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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