

# Evaluation of red blood cell distribution width and mean platelet volume levels in hypertensive and non-hypertensive epistaxis patients

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## Abstract

**Aim:** We investigated the development of epistaxis and the effect of red blood cell distribution (RDW) and mean platelet volume (MPV) levels in hypertensive patients compared to non-hypertensive patients. Epistaxis is an urgent rhinologic condition that may manifest itself as recurrent hemorrhages in small quantities or life-threatening hemorrhages. It is known that epistaxis does not develop in every hypertensive patient.

**Material and Methods:** In this retrospective study, the participants were divided into four groups as follows: Group 1 hypertensive epistaxis, Group 2 isolated epistaxis, Group 3 isolated hypertension, Group 4 control. RDW and MPV values were obtained from complete blood count (CBC) samples.

**Results:** There was a statistically significant difference in RDW and MPV blood parameters between all groups ( $p=0.02$ ). When RDW and MPV blood parameters of Group 1 with hypertensive epistaxis and Group 3 with isolated hypertension were evaluated, there was a statistically significant difference between these two groups in both parameters ( $p = 0.000$ ,  $p = 0.011$ ).

**Conclusion:** In our study, we showed that the decrease in RDW and MPV values among the hematological parameters increases the association of epistaxis with hypertension in hypertensive patients compared to non-hypertensive patients.

**Keywords:** Epistaxis; hypertension; mean platelet volume; red blood cell distribution width

## INTRODUCTION

Epistaxis is an urgent rhinologic condition that may manifest itself as recurrent hemorrhages in small quantities or life-threatening hemorrhages (1). Epistaxis usually develops from the region of the nose known as Little's area. This region defines the anterior part of the medial wall of the nose and the vascular network in Kiesselbach's plexus. Less frequently, bleeding is caused by Woodruff's plexus, another venous network on the lateral wall of the inferior meatus of the nose (2,3).

Red blood cell distribution width (RDW) and mean platelet volume (MPV) levels are routine parameters in hemogram analysis (4). RDW refers to the variability of the size of circulating red blood cells and MPV is the result of the average size of platelets in the blood (5). It has been reported that both parameters can be affected separately

in conditions such as inflammation, malignancy, obesity, diabetes, thyroid diseases, rheumatologic diseases, stroke and cardiac ischemia (6, 7). Low RDW and MPV levels have also been shown to be associated with epistaxis (7-9).

Elevated blood pressure and epistaxis coexistence is quite common in the emergency department, but the relationship between these two conditions is controversial (10). Despite this, it is known that epistaxis does not develop in every hypertensive patient (11). In this study, we aimed to investigate the development of epistaxis regardless of other factors and the relationship between epistaxis and hypertension. Another purpose of the study was to investigate the effect of red blood cell distribution (RDW) and mean platelet volume (MPV) levels as hematological blood parameters in hypertensive patients compared to non-hypertensive patients.

**Received:** 03.11.2019 **Accepted:** 17.12.2019 **Available online:** 13.03.2020

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## MATERIAL and METHODS

### Study design

The study is a retrospective observational study conducted in the Emergency Department of Bozok University Faculty of Medicine between January 2018 and January 2019. The methodology of the study was in accordance with the protocol approved by Bozok University Local Ethics Committee.

In the study, the participants were divided into four groups as follows: Group 1 hypertensive epistaxis, Group 2 isolated epistaxis, Group 3 isolated hypertension, Group 4 control. Each group was evaluated in terms of RDW and MPV and compared with another group. Results from hypertensive groups were compared with results from non-hypertensive groups. In addition, these parameters were examined and statistically analyzed in isolated epistaxis cases and isolated hypertensive cases. Mean corpuscular volume (MCV), hemoglobin (Hb), hematocrit (HCT), platelet (PLT) values were examined in each patient group. The systolic and diastolic blood pressures of the patients were measured and the effect of increased blood pressure in patients with epistaxis was also investigated.

### Study population

A total of 372 epistaxis patients over the age of 18 were admitted to the emergency department over the course of one year. Some of these patients had exclusion criteria; a total of 227 patients were included in the study.

Patients with a history of hypertension 140/90 mmHg or more were considered as hypertensive patients and were included in the hypertensive group in patients with chronic drug use. When all cases were examined, patients with nasal anomalies (septal perforation, nasal deformity, nasal tumor), nasal digital trauma and nasal foreign body were excluded from the evaluation. Patients with a history of atherosclerotic heart disease, cerebrovascular event, deep vein thrombosis, peripheral arterial disease, diabetes mellitus, metabolic syndrome, heart failure, rheumatic diseases, inflammatory bowel diseases, thyroid diseases and inflammatory diseases were also excluded as these diseases may cause errors in RDW and MPV values.

### BP measurement

BP was measured by resting the antecubital fossa from the right arm at the heart level after sitting for 5-10 minutes. The patient was seated facing the health personnel measuring the BP. The sleeve, which covers the right arm, covers 2/3 of the distance between the acromion on the shoulder and olecranon on the elbow. The radial pulse was palpated while the cuff was inflated. After the radial pulse disappeared, the cuff was inflated by another 20 mmHg, pressure was reduced at a rate of 2-3 mm/sec, and measurements were made by resting the brachial pulse with a stethoscope.

### Laboratory analysis

Tubes containing EDTA (Ethylenedinitrile-tetraacetic acid) were used for complete blood count (CBC) from all four groups. In order to prevent errors in platelet and MPV levels, samples were studied in the biochemistry laboratory with

an XN-1000 hematology analyzer (Sysmex Corporation, Kobe, Japan) within the first hour. RDW and MPV values were obtained from this study.

### Statistical analysis

Statistical analysis was performed using the Statistical Package for Social Sciences (SPSS Inc., Chicago, IL, USA) version 20.0 software. The data obtained from the study conducted within the scope of clinical research are statistically parametric and nonparametric. A skewness test was performed to determine whether the variables considered to be parametric in the data set were suitable for normal distribution. Student t test and variance analysis were used for statistical evaluation of parametric data. In the statistical analysis of nonparametric variables, Mann-Whitney U test was used for binary groups and Kruskal Wallis test for three or more groups.  $P < 0.05$  was considered as statistically significant.

## RESULTS

The study consists of 227 patients. Independent variables and demographic characteristics of epistaxis cases are shown in Table 1. The mean age of the patients was  $53.90 \pm 19.88$  (18-98 years). 127 (55.9%) patients were female and 100 (44.1%) patients were male.

**Table 1. Demographic characteristics of independent variables**

Variables	n	percent(%)
<b>Gender</b>		
Male	100	44,1%
Female	127	55,9%
<b>Study Groups</b>		
Group 1 (hypertensive epistaxis)	54	23.8%
Group 2 (isolated epistaxis)	50	22%
Group 3 (isolated hypertensive)	63	27.8%
Group 4 (control group)	60	26.4%
	<b>n</b>	<b>mean <math>\pm</math> std. deviation</b>
<b>Age</b>		
	227	53.90 $\pm$ 19.88
<b>Hematological parameters</b>		
Hemoglobin (g / dl)		13.62 $\pm$ 2.09
Hemotocrit %		41.16 $\pm$ 5.41
MCV (fL)		84.6 $\pm$ 7.02
RDW (%)		13.25 $\pm$ 1.98
MPV (fL)		10.02 $\pm$ 0.8
Platelet ( $10^3 / \mu\text{L}$ )		257.4 $\pm$ 85.8
<b>Blood pressure values</b>		
<b>Systolic blood pressure (mmHg)</b>		139.1 $\pm$ 27.09
<b>Diastolic blood pressure (mmHg)</b>		82.8 $\pm$ 11.9

There were 54 (23.8%) patients with hypertensive epistaxis in Group 1, 50 (22%) patients with isolated epistaxis in Group 2, 63 (27.8%) patients with isolated hypertension in Group 3 and 60 (26.4%) patients in the control group, Group 4.

Blood pressure values of epistaxis patients are shown in Table 2. When the effect of blood pressure values on nosebleeds was examined, systolic blood pressure was statistically significant ( $t = 2.271, p = 0.025$ ), while diastolic blood pressure was not statistically significant ( $t = 1.588, p = 0.115$ ).

RDW,MPV values of epistaxis patients are shown in Figure 1 and Table 2. There was a statistically significant difference in RDW and MPV blood parameters between all groups ( $\chi^2: 23.463, p = 0.000; \chi^2: 9.889, p = 0.020$ ). When the MPV and RDW values from the epistaxis groups were evaluated, there was no statistically significant difference between the hypertensive Group 1 and isolated epistaxis Group 2 ( $z: -0.339, p = 0.735; z: -0.342, p = 0.732$ ). When these two groups were considered as a single epistaxis group (Group 1 and Group 2), RDW blood parameters were statistically significant ( $z: -2.817, p = 0.005$ ),but MPV blood parameters were not statistically significant ( $z: -1.879, p = 0.06$ ).

Table 2. Groups, average values of data and results of Student t and Mann-Whitney U test

Group	Parametric data		Non-parametric data	
	CBP(mmHg)	DBP(mmHg)	RDW(%)	MPV(fl)
Group 1	168.3 ± 14.5	93.8 ± 5.9	12.5 ± 0.87	9.84 ± 0.63
Group 2	117.2 ± 11.07	75.6 ± 5.02	12.69 ± 0.026	9.82 ± 0.72
Group 3	156.8 ± 13.7	91.1 ± 5.4	14.2 ± 3.07	10.23 ± 0.77
Group 4	112.6 ± 9.3	69.3 ± 6.9	13.29 ± 1.35	10.1 ± 0.95

Student t test for cistolic and diyastolic blood pressure

Group 1 and Grup 3 for cistolic blood pressure:  $t=2.271, p=0.025 (p<0.05)$

Group 1 and Grup 3 for diastolic blood pressure:  $t=1.588, p=0.115(p>0.05)$

Mann-Whitney U test for MPV and RDW

Group 1 and Grup 3 for MPV and RDW:  $z:-0.734, p=0.463 ; z:-0.430, p=0.668 (p>0.05)$

Group 1 and Grup 3 for MPV and RDW:  $z:-0.339, p=0.735 ; z:-0.342, p=0.732 (p>0.05)$

Group 1 , Group 2 and Group 4 for RDW:  $z:-2.817, p=0.005 (p<0.05)$

Group 1 , Group 2 and Group 4 for MPV:  $z:-1.879, p=0.06 (p>0.05)$

Group 1 and Group 4 for RDW:  $z:-2.522; p=0.012(p<0.05)$

Group 1 and Group 4 for MPV:  $z:1.531; p=0.126(p>0.05)$

CBP: Cistolic Blood Pressure; DBP: Diastolic Blood Pressure; RDW: Red Blood Cell Distribution Width; MPV: Mean Platellet Value  
Variable are presented as mean ± SD

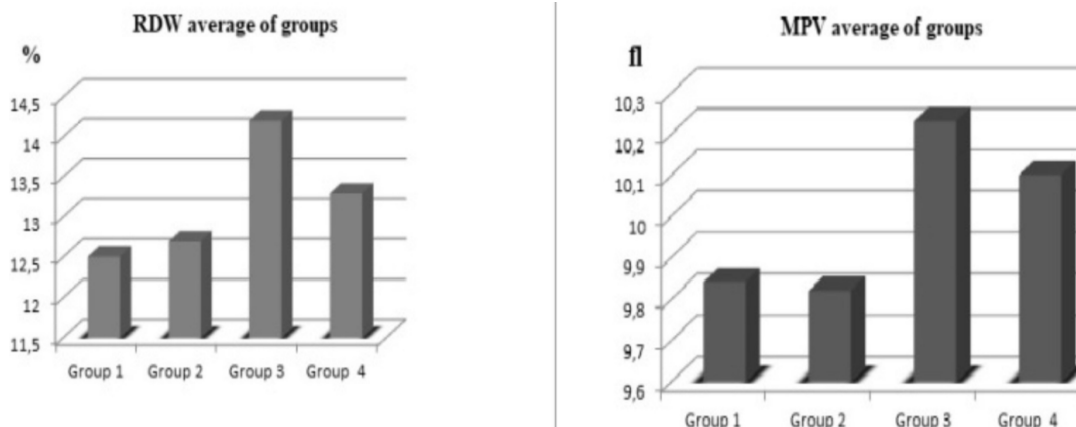


Figure 1. Average of RDW and MPV in all groups

When RDW and MPV blood parameters of Group 1 with hypertensive epistaxis and Group 3 with isolated hypertension were evaluated, there was a statistically significant difference between these two groups in both parameters (z: -3.921, p = 0.000; z: -2.538, p = 0.011). When RDW and MPV blood parameters of Group 1 and Group 4 were evaluated, RDW blood parameters were statistically significant (z: -2.522, p = 0.012), but MPV blood parameters were not statistically significant (z: 1.531, p = 0.126). When the blood Hb, HCT and PLT values were examined, there was no statistically significant difference between the groups (p = 0.099, p = 0.261, p = 0.756).

## DISCUSSION

Patients presenting with epistaxis and hypertension (HT) are serious problems for the emergency department (10). Hypertension can change the hematological parameters by causing functional and structural abnormalities to organs that are involved in hematopoiesis and viscosity of blood (12, 13).

A study conducted by Kemal et al. showed that adults with recurrent epistaxis had lower MPV and RDW levels (5). In this study, RDW and MPV values were investigated in terms of bleeding tendency, especially in the epistaxis groups. The role of HT disease which is thought to trigger epistaxis was also investigated. The decrease in the RDW value was found to be statistically significant in hypertensive epistaxis groups compared to the control group and the group with isolated hypertension disease. In addition, when the MPV value was examined, it was found to be statistically significantly lower in the hypertensive epistaxis groups compared to the isolated hypertension group and no statistical difference was found when compared with control group.

The increase in RDW indicates the presence of anemia and indicates heterogeneity of erythrocyte size in peripheral blood. The increase in MPV value is associated with shortened bleeding time (8). Although these increases are particularly likely to occur in recurrent epistaxis cases, these cases were not evaluated in our study and all epistaxis cases admitted to the emergency department were investigated. Contrary to some findings (8), RDW and MPV values were found to be lower in hypertensive epistaxis cases.

Except in cases of hypertensive epistaxis, 24-hour blood pressure monitoring is known to be the best method for detecting and monitoring end organ damage as a result of hypertension (14). Although it is not completely accepted that epistaxis is an end organ damage that can develop as a result of HT (15), many studies have examined the relationship between HT and epistaxis and even found a serious relationship between blood pressure level and epistaxis (11, 16, 17). In our study of the effect of blood pressure levels on epistaxis, it was found that an increase in systolic blood pressure levels was observed more frequently in epistaxis cases. In another study, high systolic blood pressure was found to increase the frequency of epistaxis as well as the need for rhinologic intervention (1).

The hematological evaluation by Aksakal et al. found that MPV, RDW, Hb, HCT and mean corpuscular hemoglobin concentration (MCHC) values were lower in pediatric recurrent epistaxis cases compared to the control group (9). In our study, a significant increase was detected in MCV levels in epistaxis cases compared to the control group, but no significant difference was found between the groups when Hb, HCT and PLT values were examined. Aksakal et al. also examined hematological inflammatory parameters such as Neutrophil lymphocyte ratio (NLR) and platelet to lymphocyte ratio (PLR) (9). These parameters are elevated in systemic inflammation conditions. However, in our study, these were not evaluated in either the hypertensive (18) or epistaxis groups because these parameters were variable.

Dogruyol et al. stated that high blood pressure alone, whether acute or chronic, is sufficient to explain the etiology of epistaxis. They also stated that patients who were found to be hypertensive at the time of admission to the emergency department did not require additional laboratory tests to determine the etiology of epistaxis (19). In contrast, the RDW and MPV values in our study were found to be statistically different in patients with hypertensive epistaxis compared to non-hypertensive patients and control groups, suggesting that even if the patient was hypertensive at the time of admission to the emergency department, CBC examination should be performed. Furthermore, this shows that when a hypertensive patient presents to the emergency department with low RDW and MPV levels, it can be a trigger for epistaxis as a cause of end organ damage.

## LIMITATIONS

The small number of patients included in our study constitutes our most important limitation. In addition, our study was designed retrospectively and the data obtained were based on file records and electronic data. Multicenter-designed prospective studies with larger patient groups are needed.

## CONCLUSION

Many studies in the literature have shown an increase in the frequency of epistaxis with hypertension. However, the fact that not every hypertensive patient exhibits epistaxis has not been addressed. In our study, we showed that the decrease in RDW and MPV values among the hematological parameters increases the association of epistaxis with hypertension in hypertensive patients compared to non-hypertensive patients. It is appropriate to examine each case of epistaxis presenting to the emergency department in terms of both hypertension and changes in these hematological parameters.

*Competing interests: The authors declare that they have no competing interest.*

*Financial Disclosure: There are no financial supports.*

*Ethical approval: The present study was conducted in accordance with the protocol approved by Bozok University Local Ethics Committee (2017- KAEK-189\_2019.09.09\_25).*



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