

## **Association between nasal polyps and novel inflammatory parameters.**

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### **Abstract**

**Nasal polyposis represents as a chronic hyperplastic sinusitis associated with chronic inflammation. In present retrospective study, we aimed to compare the Mean Platelet Volume (MPV), Red Cell Distribution Width (RDW) and Neutrophil to Lymphocyte Ratio (NLR) values of patients with nasal polyposis to those in healthy subjects. We included 35 nasal polyp patients and 45 healthy subjects into the study. White Blood Cell count (WBC), Neutrophil Count (NEU), Lymphocyte Count (LYM), Hemoglobin (Hb), Hematocrit (HTC), Mean Corpuscular Volume (MCV), RDW, Platelet Count (PLT) and MPV were recorded after obtaining from computerized database. There was statistically significant difference between study and control groups ( $p < 0.001$ ). Decreased MPV and elevated RDW and NLR are characteristics of nasal polyposis. These parameters may also be helpful in assessing the success of treatment. Further studies with a larger study population are needed to detect the possible correlation between MPV, RDW and NLR values in patients with nasal polyps.**

**Keywords:** Nasal polyposis, Sinusitis, Chronic inflammation, Neutrophil to lymphocyte ratio (NLR), Mean platelet volume (MPV), Red cell distribution width (RDW).

*Accepted on June 27, 2017*

### **Introduction**

Benign masses characterized with edema and inflammation in nasal cavity and paranasal sinuses are called as nasal polyps. Nasal polyposis disease represents as a chronic hyperplastic sinusitis associated with chronic inflammation [1]. These lesions extend to nasal cavity after formation from sinus mucosa. Histopathological examination reveals edematous stromal and inflammatory cells; predominantly eosinophil's [2]. Beside stuffiness and discharge of purulent secretion, polyps may also cause resistant headache and even reduction or loss of sense of smell [3]. They may relapse after unsuccessful surgery. Although, a number of studies in literature pointed out the relation between eosinophils in polyp tissue and development of these lesions we previously reported a clear association between nasal polyposis and Mean Platelet Volume (MPV); a parameter of platelet activation [4-6].

As well as MPV, other hemogram derived indices; such as Red Cell Distribution Width (RDW) and Neutrophil to Lymphocyte Ratio (NLR) are proposed as inflammatory markers in certain conditions [7-10]. In present retrospective study, we aimed to compare the MPV, RDW and NLR values of patients with nasal polyposis disease to those in healthy subjects.

### **Methods**

Patients who were diagnosed with nasal polyposis in ear nose throat clinics of our institution were enrolled to the study.

Patients with active infection, inflammatory disease, diabetes mellitus and malignancy were excluded. Subjects on treatment with an agent that may influence hemogram parameters; such as aspirin or steroid were also excluded. Control subjects were selected from healthy volunteers that visited outpatient clinics of our hospital for a routine check-up.

Demographic features; age, race and gender and laboratory parameters; White Blood Cell Count (WBC), Neutrophil Count (NEU), Lymphocyte Count (LYM), Hemoglobin (Hb), Hematocrit (HTC), Mean Corpuscular Volume (MCV), RDW, Platelet Count (PLT) and MPV were recorded after obtaining from computerized database. NLR was calculated by simply dividing of NEU by LYM. Blood samples of nasal polyposis patients were drawn into sterile hemogram tubes. Assays were done within 15 min after collecting of the samples. Complete blood count (hemogram) analysis was done in automatic analyzer of LH 780 model of Beckman Coulter device (Beckman Coulter Inc., Bre CA). Original hemogram kits were used for the manufacturer in all assays. Statistical analysis conducted by SPSS software (SPSS 15.0; SPSS Inc., Chicago, IL, USA). Data were expressed as mean  $\pm$  SD or median (min-max). Independent samples t-test or Mann-Whitney U-test used to compare variables in study population. A p-value lower than 0.05 was considered statistically significant.

## Results

We included 35 patients with nasal polyps and 45 healthy subjects into the study. Mean age of the study and control groups were  $38.9 \pm 8.6$  and  $41.1 \pm 7.5$  y, respectively. There was no significant difference between groups by age ( $p=0.23$ ). Of 35 patients, 23 were men and 12 were women in study group, while 21 were men and 24 were women of 45 control subjects. Gender was not statistically different between study and control groups ( $p=0.09$ ).

WBC, Hb, HTC, MCV and PLT values of study and control groups were not statistically significantly different ( $p>0.05$  for all). On the other hand, MPV values of patients with nasal polyposis and control subjects were  $9.2 \pm 0.8$  fL and  $10.2 \pm 1.3$  fL, respectively. There was statistically significant difference between study and control groups ( $p<0.001$ ). The RDW value of study group (13.8 (12.1-20.8)) was significantly increased compared to RDW of controls (12.9 (10.8-16.2)) ( $p=0.002$ ). Similarly, NLR of study group (1.67 (1.1-11.9)) was significantly higher than those of control subjects (1.48 (0.8-2.5)) ( $p=0.006$ ). General characteristics and laboratory data of all study population were given in Table 1.

**Table 1.** Characteristics and laboratory data of study and control groups.

		Study group	Control group	p
Gender	Men (n)	23	21	0.09
	Women (n)	12	24	
Mean $\pm$ SD				
Age (y)		$38.9 \pm 8.6$	$41.1 \pm 7.5$	0.23
Hb (g/dl)		$13.7 \pm 2.1$	$14 \pm 1.6$	0.46
HTC (%)		$41 \pm 5.5$	$41 \pm 4.3$	0.71
MPV (fL)		$9.2 \pm 0.8$	$10.2 \pm 1.3$	<0.001
Median (Min-Max)				
WBC (u/mm <sup>3</sup> )		8.1 (4-16)	5.5 (5.4-10)	0.95
NLR		1.67 (1.1-11.9)	1.48 (0.8-2.5)	0.006
MCV (fL)		83 (77-90)	83 (74-90)	0.62
RDW (%)		13.8 (12.1-20.8)	12.9 (10.8-16.2)	0.002
PLT (u/mm <sup>3</sup> )				0.8

## Discussion

The main finding of present study is that novel inflammatory markers derived from routine hemogram test useful in differentiating nasal polyposis patients from healthy subjects.

Inflammatory markers, such as C-reactive protein (CRP), have been found to be associated with MPV in inflammatory conditions. Milovanovic et al. reported that MPV was useful in determining disease activity in subjects with rheumatoid arthritis [11]. Another study revealed decreased MPV values in inflammatory bowel disease patients compared to healthy

population in which MPV was inversely and strongly correlated with serum CRP levels [12]. Statistically significant reverse correlation between CRP and MPV was also observed in patients with active inflammation by Zareifar et al. study, too [13]. Similar to the data in literature, we found significantly decreased MPV in subjects with nasal polyposis compared to those in healthy volunteers.

A possible mechanism for decreased MPV in nasal polyposis may be interaction between inflammatory cytokines and bone marrow which may stimulate megakariopoiesis to produce smaller platelets. Despite activated platelets are tend to be larger in size and cause an increase in MPV, the utilization of activated larger thrombocytes in inflammatory sites may cause a decrease in MPV due to remaining smaller thrombocytes [14].

As an overlooked hemogram indices, role of RDW is not limited to distinguish iron deficiency from other microcytic anaemia's. Recent studies showed that increased RDW could be useful in diagnosis of irritable bowel syndrome, in inflammatory bowel disease in Hashimoto disease and in rheumatoid arthritis [15-19]. Although Clarke et al. reported elevated RDW in subjects with inflammatory bowel disease; the mean Hb and HTC values of the study group were also significantly lower than that of the controls, which can be a confounding factor [16]. However, Hb and HTC values were similar in both study and control groups in our report. Findings of present study suggest the data in literature that inflammatory conditions are associated with elevated RDW. Cytokines released from inflammatory micro environment may have effects on erythropoiesis in bone marrow which results in production of different sized red cells. Therefore, increased RDW values observed in many inflammatory diseases in literature.

Neutrophil to lymphocyte ratio is a derivative index of complete blood count assays. NLR has been found to be related with inflammatory conditions and in carcinomas [20-25]. Inflammatory stimulus may induce neutrophil production and decreased lymphocyte is associated with poor prognosis, which make elevated NLR as a reliable marker of inflammation and outcome in many clinical conditions [26,27]. Elevated circulating cytokines depresses the production and release to blood stream of lymphocytes [27]. Therefore, elevated NLR is not surprising in patients with inflammatory conditions. Findings expressed in this retrospective study also suggest the data in literature.

Two major limitation of this study are relatively small sample size and retrospective design which all make our results difficult to interpret.

In conclusion, decreased MPV and elevated RDW and NLR could be considered as characteristics of nasal polyposis. These parameters may also be helpful in assessing the success of surgical treatment.

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