Study the relationship between nasal polyps, platelet count, mean platelet volume, neutrophil/lymphocyte ratio in patients attending otolaryngology OPD in a tertiary care teaching hospital, West Bengal

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ABSTRACT

Background: Nasal obstruction is a common cause of marked nasal septal deviation. It is related strongly with hypoxia. Hypoxic conditions increase mean platelet volume levels. Many studies in literature point out that inflammation related to nasal polyp is mostly dependent on eosinophils and their inflammatory products. Beside eosinophils, platelets may have a role in nasal polyp development. Platelets are involved in hemostasis, tissue repairing and inflammation. Recently, mean platelet volume (MPV) was recognized as a simple inflammatory marker in the inflammatory disease. This study investigated the relationship of nasal polyps with MPV (mean platelet volume), platelet count and NLR (neutrophil to lymphocyte ratio).

Methods: The cross-sectional observational study we investigated CBC (complete blood count) parameters of the patients that consulted ENT clinic in a tertiary care teaching hospital, Haldia because of nasal polyp. About 76 patients and 42 controls were included in this study. In all groups, WBC (white blood cell count), RBC (red blood cell count), RDW (red cell distribution width), platelet count, MPV, PDW (platelet distribution width) and NLR parameters from CBC (complete blood count) were compared between patients and controls.

Results: Mean WBC values were 6.89±1.33×10^3/μL in patients with NPs, vs. 7.11±2.32×10^3/μL in the control group. Mean haemoglobin (Hb) values were 13.19±1.34 g/dL in patients with NPs, vs. 14.1±1.67 g/dL in the control group. Mean MPV values were 9.11 ± 1.08 fL in patients with NPs, vs. 8.32±0.53 fL in the control group. Mean PLT values were 232.38 ± 39.97×10^3/μL in patients with NPs, vs. 271.44±45.14×10^3 in the control group. MPV was higher in nasal polyp patients, whereas platelet count was higher in controls. The difference was significant for the mean absolute neutrophil, platelet count, and lymphocyte counts, NLR, PDW and MPV values between the study group and the control group.

Conclusions: Platelet count and NLR were significantly lower in patients than the controls, whereas MPV was significantly higher in nasal polyp patients.

Keywords: Nasal polyps, Controls, Mean platelet volume, Platelet count, White blood cell count, Neutrophil-to-lymphocyte ratio
INTRODUCTION

Nasal polyps (NPs) are a benign mucosal disorder as a result of mucosal inflammation that originates from any portion of the nasal mucosa or paranasal sinuses. It is the most common non-neoplastic lesion in the nasal cavity. It also is a very common cause of chronic nasal obstruction. They are characterized by chronic mucosal inflammation of the nose and paranasal sinuses. They are observed twice as much in men than in women and incidence in the population is about 1-4%. The polyps are found in 36% of patients with aspirin intolerance, in 7% of those with asthma, in 20% of those with cystic fibrosis and in 2% of those with chronic rhinosinusitis.

Nasal polyps are among the common causes of chronic nasal congestion which may cause OSAS (obstructive sleep apnea syndrome) later and OSAS is associated with several cardiovascular diseases, such as congestive heart failure, hypertension, atrial fibrillation, nocturnal arrhythmias, stroke, pulmonary hypertension, and atherosclerosis. Mean platelet volume (MPV) is an important indicator of platelet activity.

Studies in literature point out that inflammation related to nasal polyp is mostly dependent on eosinophils and their inflammatory products. Beside eosinophils, platelets may have a role in nasal polyp development. Platelets are involved in haemostasis, tissue repairing and inflammation. Although the relationship between nasal polyps and MPV was investigated in previous studies; we did not encounter any studies on the relationship between MPV, NLR and nasal polyps in Indian subjects.

METHODS

The cross-sectional observational study was done after institutional ethics committee permission. In this study we investigated CBC (complete blood count) parameters of the patients that consulted ENT clinic in a tertiary care teaching hospital, Haldia because of nasal polyp; between June 2015 to December 2015, who were ready to give informed consent for the above study. Patients with associated cardiovascular disorders and on antiplatelet therapy, smoking history or bleeding diathesis and aged over 65 and below 18 were excluded in the study. Patients with nasal polyp were not categorized according to the size or the side of the polyp. Control subjects were selected from age and sex matched persons from Haldia.

In both the groups, WBC (white blood cell count), RBC (red blood cell count), RDW (red blood cell distribution width), platelet count, MPV, PDW (platelet distribution width) and NLR parameters from the CBC results were compared between patients and controls. NLR was calculated as follows: NLR = Absolute neutrophil count/absolute lymphocyte count. CBC measurements were performed with an automated blood cell counter (Sysmex XE-2100; Sysmex, Kobe, Japan). All samples were run in duplicate, and the mean values of absolute neutrophil, platelet count, and lymphocyte count, MPV and NLR were compared between the study group and the control group. All of the investigations were statistically analyzed using SPSS program version 20 (IBM Corporation, NY, US). A two-tailed unpaired Student’s t test was used to compare parametric conditions. A p value less than 0.05 was considered significant for all comparisons.

RESULTS

Out of 76 total cases of patients with nasal polyps, 30 [39.47%] of the patients were females and 46 [60.52%] were males, with a mean age of 41.08±16.5 years. About 24 males and 18 females were included in the control group, with a mean age of 39.8±13.9 years. There was no significant difference between the two groups regarding age and gender distribution as shown in Table 1.

Table 1: Distribution of age and values of WBC, HB, PLT and MPV in patients with nasal polyp and controls.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Nasal Polyp Mean ± SD</th>
<th>Control Mean ± SD</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>41.08±16.5</td>
<td>39.8±13.9</td>
<td>0.67</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>46 [60.52%]</td>
<td>24 [57.14%]</td>
<td>-</td>
</tr>
<tr>
<td>Female</td>
<td>30 [39.47%]</td>
<td>18 [42.85%]</td>
<td>-</td>
</tr>
<tr>
<td>WBC</td>
<td>6.89±1.33x103/μL</td>
<td>7.11±2.32x103/μL</td>
<td>0.5134</td>
</tr>
<tr>
<td>Hb</td>
<td>13.19±1.34 g/dL</td>
<td>14.1±1.67 g/dL</td>
<td>0.0016 *</td>
</tr>
<tr>
<td>PLT</td>
<td>232.38±39.97x103/μL</td>
<td>271.44±45.14x103</td>
<td>0.0001 *</td>
</tr>
<tr>
<td>MPV</td>
<td>9.11 ± 1.08 fL</td>
<td>8.32 ± 0.53 fL</td>
<td>0.001 *</td>
</tr>
<tr>
<td>PDW</td>
<td>16.4±1.16 fL</td>
<td>15.78±1.32 fL</td>
<td>0.0093 *</td>
</tr>
<tr>
<td>PCT</td>
<td>0.22±0.068</td>
<td>0.23±0.069</td>
<td>0.44</td>
</tr>
<tr>
<td>NLR</td>
<td>1.5 ± 0.4</td>
<td>1.8 ± 0.5</td>
<td>0.0005 *</td>
</tr>
</tbody>
</table>

[MPV: Mean platelet volume; NLR: Neutrophil to lymphocyte ratio; WBC: White blood cell count; PLT: platelet; SD: standard deviation; PCT: Platelet crit; RDW: Red cell distribution width; PDW: Platelet distribution width; *: Statistically significant]
Mean WBC values were 6.89±1.33x103/μL in patients with NPs, vs. 7.11±2.32x103/μL in the control group. There were no significant differences in WBC values between the two groups (p =0.51) as seen in Table 1. Mean haemoglobin (Hb) values were 13.19±1.34 g/dL in patients with NPs, vs. 14.1±1.67 g/dL in the control group. There were significant differences in Hb values between the two groups (p =0.0016) as given in Table 1. Mean MPV values were 9.11±1.08 fL in patients with NPs, vs. 8.32±0.53 fL in the control group. There were significant differences in MPV values between two groups (p=0.0001) as in Table 1. Mean PLT values were 232.38±39.97x103/μL in patients with NPs, vs. 271.44±45.14x103 in the control group.

There was significant differences in PLT values between the two groups (p =0.0001) as in Table 1. PDW values were 16.4±1.16 fL in patients with NPs, vs. 15.78±1.32 fL in the control group. There were significant differences in PDW values between the two groups (p= 0.0093) as presented in Table 1. PCT values were 0.22±0.068 in patients with NPs, vs. 0.23±0.069 in the control group. There was no significant difference in PCT values between the two groups (p =0.44) as tabulated in Table 1.

<table>
<thead>
<tr>
<th></th>
<th>NPs (n=49)</th>
<th>Control (n=76)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>64.47%</td>
<td>35.52%</td>
<td>0.0004</td>
</tr>
<tr>
<td>M</td>
<td>63.04%</td>
<td>36.95%</td>
<td>0.36</td>
</tr>
<tr>
<td>W</td>
<td>56.6%</td>
<td>43.3%</td>
<td>0.00</td>
</tr>
</tbody>
</table>

In 49 [64.47%] patients were bilateral (n = 76) and 27 [35.52%] in patients were unilateral. In men, 29 [63.04%] were bilateral (n=46), and 17 [36.95%] were unilateral. In women, 17 [56.6%] were bilateral (n = 30), and 13 [43.3%] were unilateral. MPV was higher in nasal polyp patients, whereas platelet count was higher in controls as in Table 1. The difference was significant for the mean absolute neutrophil, platelet count, and lymphocyte counts, NLR, PDW and MPV values between the study group and the control group as depicted in Table 1.

**DISCUSSION**

Nasal polyps diagnosed clinically are not always of inflammatory origin. A variety of non-neoplastic and neoplastic conditions can present as nasal polyps. Non-neoplastic conditions such as Wegener’s granulomatosis, sarcoidosis, rhinosporidiosis; benign neoplastic conditions such as inverted papilloma, capillary hemangioma (pyogenic granuloma), angiofibroma, chondroma, plasmacytoma, meningioma, leiomyoma, schwannoma, meningioencephalocoele, pituitary adenoma, paranganglioma; and malignant conditions such as squamous cell carcinoma, adenocarcinoma, malignant melanoma, chordoma, olfactory neuroblastoma, rhadomyosarcoma and adenoid cystic carcinoma can present as nasal polyps.9-11

Nevertheless, the majority of nasal polyps result as a consequence of chronic mucosal inflammation, and inflammatory polyps are the commonest of all polypoidal lesions in the nose presenting as nasal polyps and are synonymous with nasal polyps.11

Platelet activation and aggregation is closely associated with cardiovascular complications. In many studies, platelet activation and aggregation have been reported to increase in patients with OSAS.12,13 Mean platelet volume (MPV) is a parameter used as an indicator of platelet activation. Larger platelets are more reactive than normal-sized ones and have higher prothrombotic potentials. Mean platelet volume is considered as a marker of atherosclerosis.14-17

In previous studies, MPV has been reported to increase in adult cerebrovascular and cardiovascular conditions such as hypertension, unstable angina pectoris, myocardial infarction and stroke.16 It has been shown that elevated MPV levels could be associated with the prognoses of these diseases.16

CBC is a widely used blood test that provides useful information about patient general health and inflammatory status. High neutrophil and platelet counts reflect inflammation, whereas a low lymphocyte count reflects general stress and poor health.17 NLR is a practical, cost-effective and valuable marker of inflammatory state that can easily be calculated from CBC tests.18 It has been found to be a valuable predictor of poor prognosis and long-term mortality in oncological patients, in coronary artery disease, end-stage renal disease and inflammatory diseases such as ulcerative colitis and appendicitis.19-24

When WBC parameter was examined in the current study, there were no significant differences between the patients and the controls in any of the three groups. In the study by Aktas et al and Sagit et al WBC parameter was not different in patients and controls again and both of these studies are supporting our results.23,24

“RDW” is a numerical measure of the size variability of circulating erythrocytes.23 Disorders related to ineffective erythropoiesis or increased red blood cell destruction cause heterogeneity in size and a higher RDW.26,27 RDW has been reported as an independent predictor of adverse outcomes in the general population and is believed to be associated with cardiovascular morbidity and mortality in patients with a previous myocardial infarction.28,30

Platelet count in the studies of Aktas et al and Sagit et al was not different between patients with nasal polyps and controls, however unlike these studies; we have observed that the platelet count was significantly lower in patients than in controls group.8,24 A study by Ulu et al in which the platelet count was investigated in patients with septal deviation which frequently causes chronic nasal congestion reported that the platelet count was lower in patients than in controls supporting our results.31

Increased platelet activity is associated with increased platelet volume, which can be measured by larger mean platelet volume (MPV) and platelet distribution width (PDW). Large platelets are more adhesive and tend to
aggregate more than smaller ones. This increase in platelet volume increases the tendency for coronary thrombus formation in acute coronary syndrome patients. MPV is also used as a marker in atherosclerosis. Many clinical studies have shown that increased MPV in patients with OSAS is associated with increased risk of atherosclerosis and cardiac disorders.

In our study, PDW scores were different between patients with nasal polyps and controls. The study by Sagit et al which investigates the relationship between nasal polyps and PDW did not report a difference between the patients and the controls, further not supporting our data.

When MPV scores were examined in the current study, significantly higher MPV scores in patients with nasal polyps than in controls. In literature, the study by Sagit et al directly investigating the relationship between nasal polyps and MPV reported a significantly higher MPV score in patients than in controls, whereas the study by Aktas et al found an MPV score significantly lower in patients than in controls. Our study, especially the significant difference, supports the study by Sagit et al. Other studies including patients with OSAS have reported significantly higher MPV scores in patients than in controls. Again, the study by Ulu et al on patients with septal deviation causing chronic nasal congestion reported significantly higher MPV scores in patients than in controls. The study by Cengiz et al on adenoid hypertrophy patients (which causes pediatric OSAS) reported lower MPV scores in patients. All these results show that the relationship between MPV, nasal congestion and OSAS is not clear yet.

The neutrophil-to-lymphocyte ratio (NLR) and platelet-to-lymphocyte ratio (PLR) have been defined as novel markers of inflammation and thrombotic events which can be easily measured from the complete blood cell count (CBC). Sudden sensorineural hearing loss, Bell’s palsy and vestibular neuritis are certain pathological conditions that have been found to be related to NLR and PLR in otolaryngological practice. Mean platelet volume (MPV) is a blood marker related to function and activation of platelets.

A study on patients with stroke reported that NLR increase and CRP (C reactive protein) which is an inflammation marker are significantly correlated. The study by Gokhan et al showed NLR scores increase significantly in ischemic and hemorrhagic stroke. Because OSAS and cardiovascular diseases are frequently observed in patients with nasal polyps in which structure of neutrophil and lymphocytes play an important role, we have chosen to investigate the relationship between nasal polyps and NLR scores. In our study, we observed that the NLR scores were significantly lower in patients with nasal polyps than controls.

Mean platelet volume has emerged as a marker of inflammation that is routinely examined in CBC tests. A high level of MPV is indicative of increased platelet activity, which causes more intense inflammation. An increased level of MPV was found to be related to various pathological conditions, including cardiovascular and cerebrovascular disorders, and deep venous thrombosis. MPV was also investigated in some studies related to otolaryngological pathologies. Poorey et al reported an increased level of MPV due to chronic nasal obstruction in patients with deviated nasal septum.

**CONCLUSION**

Platelet count and NLR were significantly lower in patients than the controls, whereas MPV was significantly higher in nasal polyp patients. We believe these parameters will have increasing clinical use in the future as more information is gathered from large-scale prospective studies that will investigate the effect of hematological parameters on treatment options and prognosis.

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**Conflict of interest: None declared**

**Ethical approval: The study was approved by the Institutional Ethics Committee**

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