Peripheral Eosinophil Count and Allergy in Patients with Coronary Artery Disease

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ABSTRACT

Aim: to investigate the relationship between peripheral blood eosinophil count and history of allergy with CAD.

Methods: in a case-control study in Ali-ebn-Abitaleb Educational Hospital of Rafsanjan, Iran, 190 individuals (95 with CAD and 95 without CAD) with mean age of 59.4±12.6 were investigated. Eosinophil count in peripheral blood, eosinophil leukocyte ratio, neutrophil count and neutrophil/leukocyte ratio were measured. A history of allergy was taken from the participants.

Results: there were no significant differences in sex and age among two groups. The mean leukocyte count was 8802.6 ± 253.3 and 3813.7 ± 351.9 for case and control groups, respectively; that is, a statistically significant difference, (p<0.05). Eosinophil percent was 1.43% and 0.88% in case and control groups, respectively and this parameter was also significantly higher in case group. History of allergy was not different between the 2 groups. Elevated numbers of eosinophils were observed in Iranian patients with CAD.

Conclusion: the present results support the theory that eosinophils may have a role in the pathogenesis of ischemic heart disease.

Key words: coronary artery disease, eosinophil, allergy.
products of mast cells.\textsuperscript{9,10} In our previous study elevated levels of serum IgE were observed in patients with ischemic heart diseases which represented that IgE may play an important role in the immunopathogenesis of diseases.\textsuperscript{11}

This study was conducted for the first time in an Iranian population to investigate the relationship between peripheral blood eosinophil count and history of allergy with coronary artery diseases.

**METHODS**

**Subjects**

In this case-control study 190 individuals with mean age of $59.4 \pm 12.6$ were investigated in Ali-ebn-Abitaleb educational hospital in Rafsanjan (a city located in Kerman province in the south-east of Iran).

The case group consisted of 95 individuals (58 men and 37 women) from the patients admitted in CCU due to coronary artery disease. The control group consisted of 95 individuals (56 men and 39 women) from the patients admitted in general surgery ward and had no evidence of coronary artery disease in their history, physical examination and electrocardiogram. A simple random sampling was done for both groups and the groups were matched for age and sex.

**Determination of Complete Blood Count and History of Allergy**

Parameters to be measured were as follows: eosinophil count in peripheral blood, eosinophil leukocyte ratio, neutrophil count and neutrophil/leukocyte ratio. Collecting data, in order to measure these parameters, was performed by doing a CBC (complete blood count) by coulter instrument (abacus model) and also through the assessment of peripheral blood smear with Gimsa staining. In addition, a history of allergy was taken from the individual to find if there is a history of allergy such as asthma, allergic rhinitis, urticaria and atopic dermatitis. The presence of any indicated item was considered as a positive history of allergy or atopy.

**Statistical Analysis**

Independent t-test and Chi-square test were used to compare continual and nominal discrete parameters, respectively. The association of allergy with coronary artery disease and the relationship between eosinophils and leukocytes in each group were investigated using odds ratio and pearson’s correlation coefficient, respectively. A p value of $<0.05$ was considered statistically significant. The average items were expressed as mean $\pm$ SEM.

**RESULTS**

The studied parameter is present in Table 1. In this study, 61% of cases were male and 39% were female; while in control group, 59% were men and 41% were women and there was no significant difference between case and control groups. The mean age in case and control groups was $60.4 \pm 12.6$ and $58.4 \pm 12.5$, respectively. There were no significant difference in sex and age among two groups and these results showed that the two groups were matched for age and sex. The mean eosinophil count was $124.9 \pm 15.6$ and $79.1 \pm 11.8$ in case and control groups, respectively, and this parameter was significantly higher in case group ($p<0.02$). The mean leukocyte count was $8802.6 \pm 253.3$ and $3813.7 \pm 351.9$ for case and control groups, respectively, that is, a statistically significant difference, too ($p<0.05$). The average neutrophil count in case and

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Ischemic heart disease group</th>
<th>Control group</th>
<th>Total</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (year)</td>
<td>$60.4 \pm 12.6$</td>
<td>$58 \pm 12.5$</td>
<td>$59.5 \pm 12.6$</td>
<td>0.28</td>
</tr>
<tr>
<td>Male sex (%)</td>
<td>61</td>
<td>59</td>
<td>60</td>
<td>0.88</td>
</tr>
<tr>
<td>Leukocyte (mm$^3$)</td>
<td>$8802.6 \pm 253.3$</td>
<td>$9813.7 \pm 351.9$</td>
<td>$9308.1 \pm 219.3$</td>
<td>0.02</td>
</tr>
<tr>
<td>Neutrophil (per mm$^3$)</td>
<td>$6240 \pm 245.3$</td>
<td>$7235.7 \pm 293.6$</td>
<td>$6737.9 \pm 194.2$</td>
<td>0.01</td>
</tr>
<tr>
<td>Neutrophil (%)</td>
<td>69.9</td>
<td>74.1</td>
<td>72.09</td>
<td>0.01</td>
</tr>
<tr>
<td>Eosinophil (per mm$^3$)</td>
<td>$124.9 \pm 15.6$</td>
<td>$79.1 \pm 11.8$</td>
<td>$102 \pm 9.9$</td>
<td>0.02</td>
</tr>
<tr>
<td>Eosinophil (%)</td>
<td>1.43</td>
<td>0.88</td>
<td>1.16</td>
<td>0.01</td>
</tr>
<tr>
<td>Positive allergy history (%)</td>
<td>36.8</td>
<td>31.5</td>
<td>39.2</td>
<td>0.54</td>
</tr>
</tbody>
</table>

Data for age expressed as mean $\pm$ SD and for other parameters as mean $\pm$SEM
control groups was $6240 \pm 245.3$ and $7235.7 \pm 293.6$, respectively, and this difference was also significant ($p<0.05$). In addition, neutrophil/leukocyte ratio in control group was significantly more than the ratio in case group ($p<0.05$). Eosinophil/leukocyte ratio in case and control groups was 1.43% and 88%, respectively, and this value was statistically significant ($p<0.05$). The two groups were not significantly different for their history of allergy (the odds ratio for allergy was 1.264).

In analysis with pearson’s correlation coefficient, there was no significant correlation either between the number of leukocytes and eosinophils or between the number of eosinophils and the patients’ age.

The influence of allergy history as a confounding factor, was controlled by using mantel-Haenzel square test and despite controlling the history of allergy, eosinophil count and ratio in patients with ischemic heart disease was significantly more than that in control group.

**DISCUSSION**

The results of this study showed that the absolute number of eosinophils and the eosinophil/leukocyte ratio in peripheral blood smear were significantly elevated in patients with coronary artery disease (CAD) compared to control group. Accordingly, it seems that there is a positive relationship between CAD and peripheral eosinophil count. This finding is consistent with other studies, in which an association was observed between peripheral eosinophil count and CAD. In a small case-control study comparing patients with vasospastic angina pectoris, stable angina, and no angina (controls), eosinophil counts were significantly higher in those who had severe vasospastic angina pectoris than in those who had mild vasospastic angina pectoris, stable angina, or no angina. After treatment with anti-anginal drugs, however, the eosinophil counts decreased to control levels. Prentice et al. and Sweetnem et al., reported a direct association between CAD and peripheral eosinophil count. In addition, a positive relationship was reported in those studies between eosinophil count and cardiovascular events in future. In a study done by Hospers et al., patients with CAD and higher eosinophil count had a higher mortality rate than the ones with lower eosinophil count.

The exact mechanisms by which eosinophil might influence the development of CAD remains to be determined. Eosinophils are involved in inflammatory reactions and are subjected to a process of cellular activation. Eosinophils synthesize and release bioactive mediators such as leukotriene C4, a potent stimulant of vasoactivity and smooth muscle contraction. Besides the direct activities of these eosinophil-derived mediators, once stimulated, eosinophils can induce the release of a number of vasoactive substances, including histamine, prostaglandin D2, and leukotrienes C4 and D4, from mast cells and basophils. Accordingly, vasoactive substances not only derived from eosinophils but also derived from activated mast cells that may influence cardiovascular system. Moreover, it has been reported that eosinophils and their products might adversely affect the course of myocardial infarction. Eosinophil cationic protein, known for its cytotoxic properties, has been observed in increased concentrations in serum of patients with AMI and angina pectoris.

It should be noted that the association between eosinophilia and CAD in our study was not influenced by the process of leukocytosis in patients who underwent an operation, because there was no significant correlation between leukocyte and eosinophil count in any of the groups.

In our study, there was no significant relationship between CAD and history of allergy (odd ratio = 1.26). However, in our previous study and in the study of Korkmaz et al., there was a direct association between CAD and level of blood IgE, as the allergy index. Therefore, it is suggested to use objective assessments such as blood IgE or RAST skin test, in order to assess about allergy.

**CONCLUSION**

Elevated numbers of eosinophils were observed in Iranian patients with CAD. The present results support those ideas that eosinophils may have a role in the pathogenesis of ischemic heart disease.

**ACKNOWLEDGMENTS**

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**REFERENCES**


