A COMPARATIVE STUDY OF BLOOD LEUCOCYTE COUNT IN SMOKERS WITH CHRONIC OBSTRUCTIVE PULMONARY CONDITION AND NON-SMOKERS

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Abstract

Background and Objective: The determination of hematological indices provides physiological information on a proper blood assessment. Accurate laboratory determination of blood parameters remains the only sensitive and reliable foundation for ethical and rational research, diagnosis, treatment and prevention of diseases. In the present study we investigated the blood leucocyte count in chronic obstructive pulmonary disease in young adult men. Materials and Methods: The present study was conducted at Kasturba Medical College, Mangalore, after the institutional ethical clearance and informed consent from all the participants. Under aseptic condition blood was collected for total leucocyte count and differential leucocyte count using automated haematology analyzer. Routine pulmonary function testing was done on them by using Patrick Morgan’s Benchmark computerized spirometry. Students’t test was used to find out the significance of difference using SPSS version 11. P values less than 0.05 was considered the level of significance. Result: The mean blood leucocyte count and differential leucocyte count among smokers with COPD and non-smokers were well within the normal limits. P value was above the level of significance. Conclusion: This shows that smoking alone doesn’t invoke any rise in total leucocyte count in blood.

Keywords: Chronic obstructive pulmonary disease, Total Leucocyte Count, Differential Leucocyte Count.

1. Introduction:

Smoking was and has been baned in the society. It has been implicated that as one of the chief cause for negating good respiratory health1. There is hardly any system, which has not been affected directly or indirectly by smoking, no matter however significant or insignificant it might be. The history of smoking can be dated to as early as 5000 BC, and has been recorded in many different cultures across the world. Early smoking evolved in association with religious ceremonies; as offerings to deities, in cleansing rituals or to allow shamans and priests to alter their minds for purposes of divination or spiritual enlightenment2. After the European exploration and conquest of the Americans, the practice of smoking tobacco quickly spread to the rest of the world. In regions like India and sub-Saharan Africa it merged with existing practices of smoking (mostly of cannabis). In Europe, it introduced a new type of social activity and a form of drug intake which previously had been unknown.

Perception surrounding smoking has varied over time and from one place to another; holy and sinful, sophisticated and vulgar, a panacea and deadly health hazard. Only relatively recently, and primarily in industrialized Western countries, has smoking come to be viewed in a decidedly negative light. Today medical studies have proven that smoking tobacco is among the leading causes of many diseases such as lung cancer, heart attacks, COPD, erectile dysfunction and can also lead to birth defects. The inherent health hazards of smoking have caused many countries to institute high taxes on tobacco products and anti-smoking campaigns are launched every year in an attempt to curb tobacco smoking3.

Inhaling the vaporized gas form of substances into the lungs is a quick and very effective way of delivering drugs into the bloodstream (as the gas diffuses directly into the pulmonary vein, then into the heart and from there to the brain) and affects the user within less than a second of the first inhalation. The lungs consist of several million tiny bulbs called alveoli that altogether have an area of over 70 m² (about the area of a tennis court). This can be used to administer useful medical as well as recreational drugs such

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as aerosols, consisting of tiny droplets of a medication, or as gas produced by burning plant material with a psychoactive substance or pure forms of the substance itself. Not all drugs can be smoked, for example the sulphate derivative that is most commonly inhaled through the nose, though purer free base forms of substances can, but often requires considerable skill in administering the drug properly. The method is also somewhat inefficient since not all of the smoke will be inhaled. The inhaled substances trigger chemical reactions in nerve endings in the brain due to being similar to naturally occurring substances such as endorphins and dopamine, which are associated with sensations of pleasure. The result is what is usually referred to as a "high" that ranges between the mild stimulus caused by nicotine to the intense euphoria caused by heroin, cocaine and methamphetamines.

Inhaling smoke into the lungs, no matter the substance, has adverse effects on one's health. The incomplete combustion produced by burning plant material, like tobacco or cannabis, produces carbon monoxide, which impairs the ability of blood to carry oxygen when inhaled into the lungs. There are several other toxic compounds in tobacco that constitute serious health hazards to long-term smokers from a whole range of causes; vascular abnormalities such as stenosis, lung cancer, heart attacks, strokes, impotence, low birth weight of infants born by smoking mothers. 8% of long-term smokers develop the characteristic set of facial changes known to doctors as smokers face.

Chronic obstructive pulmonary disease (COPD), also known as chronic obstructive lung disease (COLD), chronic obstructive airway disease (COAD), chronic airflow limitation (CAL) and chronic obstructive respiratory disease (CORD), is the occurrence of chronic bronchitis or emphysema, a pair of commonly co-existing diseases of the lungs in which the airways become narrowed. This leads to a limitation of the flow of air to and from the lungs, causing shortness of breath that is dyspnœa. In clinical practice, COPD is defined by its characteristically low airflow on lung function tests. In contrast to asthma, this limitation is poorly reversible and usually gets progressively worse over time. In England, an estimated 842,100 of 50 million people have a diagnosis of COPD. COPD is caused by noxious particles or gas, most commonly from tobacco smoking, which triggers an abnormal inflammatory response in the lung. The determination of hematological indices provides physiological information on a proper blood assessment. The accurate laboratory determination of blood parameters remains the only sensitive and reliable foundation for ethical and rational research, diagnosis, treatment and prevention of diseases. Hence, in the present study we investigated the blood leucocyte count in chronic obstructive pulmonary disease in young adult men.

2. Materials and Methods
Patients attending the outpatient departments of Kasturba Medical College Hospital, Attavar, Mangalore were recruited for the study after the informed and written consent from all the participants. The Non smokers, Non-pulmonary diseases/disorders leading to pulmonary/haematological derangement, Age group <30 years (As significant numbers of smokers also belong to teenage group, who must have smoking history of approximately one decade for the C.O.P.D to manifest. So we have taken 30 years of age as cut-off point. That is why, even if cases belonging to the above mentioned age group attends O.P.D for vague upper respiratory tract-related complaints, they have been subjected to Pulmonary function testing for identifying C.O.P.D also, given the history of smoking and Females were exclude from the study. For C.O.P.D cases, FEV1/FVC% >70% and Peak Expiratory Flow Rate (P.E.F.R) variability > 15% after bronchodilator inhalation were excluded. Male adult smokers diagnosed for COPD other than the above mentioned criteria and hundred non-smoking adult males as controls were included in the study. Under aseptic condition blood was collected for total leucocyte count and differential leucocyte count using automated haematology analyzer.

2.1 Statistical Analysis: The data were expressed as percentage. Students’ t test was used to find out the significance of difference using SPSS version 11. P values less than 0.05 was considered the level of significance.

3. Results:
In the present study Total Leucocyte Count and Differential Leucocyte Count in hundred non-smoking adult males and male adult smokers diagnosed for COPD was performed. Results were expressed in Table 1 and 2 and in Fig-1. The Total Leucocyte Count was compared between non-smoking adult males and male adult smokers diagnosed for COPD and found to be statistically insignificant (p=0.5589, Table-1). The Differential Leucocyte Count was also compared between two groups and was also found to be
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statistically insignificant (Table-2, Fig-1). The neutrophil count in the patients presenting COPD when compared with normal individuals were found to be declined insignificantly (p=0.53). The lymphocyte count in the patients presenting COPD when compared with normal individuals were found to be increased insignificantly (p=0.10). The eosinophil count in the patients presenting COPD when compared with normal individuals were found to be declined insignificantly (p=0.13). The variation in basophil count in the patients presenting COPD when compared with normal individuals was found to be maintained at almost the same level. The monocyte count in the patients presenting COPD when compared with normal individuals were found to be increased insignificantly (p=0.06).

Table 1: The total leucocyte count in blood among smokers with COPD and non-smoker adults.

<table>
<thead>
<tr>
<th></th>
<th>COPD</th>
<th>Normal</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Leucocyte Count</td>
<td>6162 ± 246 cells/cu.mm</td>
<td>6140 ± 284 cells/cu.mm</td>
<td>0.5589 (NS)</td>
</tr>
</tbody>
</table>

Values are Mean ± SD. N=100 in each group.

Note: COPD= Chronic Obstructive Pulmonary Disease, NS=Non-Significant

Table 2: The differential leucocyte count in blood among smokers with COPD and non-smoker adults.

<table>
<thead>
<tr>
<th></th>
<th>COPD</th>
<th>Normal</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neutrophil (N)</td>
<td>56.5 ± 4.6</td>
<td>57.1 ± 8.4</td>
<td>0.5317 (NS)</td>
</tr>
<tr>
<td>Lymphocyte (L)</td>
<td>34.4 ± 2.8</td>
<td>33.7 ± 3.2</td>
<td>0.1013 (NS)</td>
</tr>
<tr>
<td>Eosinophil (E)</td>
<td>2.8 ± 1.2</td>
<td>3.1 ± 1.6</td>
<td>0.1352 (NS)</td>
</tr>
<tr>
<td>Basophil (B)</td>
<td>0.5 ± 0.8</td>
<td>0.5 ± 0.6</td>
<td>1.000 (NS)</td>
</tr>
<tr>
<td>Monocyte (M)</td>
<td>5.8 ± 0.8</td>
<td>5.6 ± 0.7</td>
<td>0.0614 (NS)</td>
</tr>
</tbody>
</table>

Values are Mean ± SD. N=100 in each group.

Note: COPD= Chronic Obstructive Pulmonary Disease, NS=Non-Significant

4. Discussion

COPD has probably always existed but has been called by different names in the past. Bonet described a condition of “voluminous lungs” in 1679. In 1769, Giovanni Morgagni described 19 cases where the lungs were “turgid” particularly from air. Mathew Baillie illustrated an emphysematous lung in 1789 and described the destructive character of the condition. Badham used the word "catarrh" to describe the cough and mucus hypersecretion of chronic bronchitis in 1814. He recognised that chronic bronchitis was a disabling disorder. The mean blood leucocyte count among smokers was well within the normal limits. Therefore it correlates with the mean blood leucocyte count, arrived upon in smokers by F. Corre et al10. An increased number of red blood cells occur when the person has had low oxygen levels in the blood (hypoxemia) for a long period of time. Red blood cells carry oxygen in the blood. Because of damage to the lungs, a person with COPD often...
cannot get enough air. The body reacts by producing more red blood cells to try to increase the amount of oxygen in the blood. An increased number of white blood cells that fight infection (neutrophils) may mean that the person has an infection. An increase in neutrophils can also occur in response to using oral or intravenous (IV) corticosteroids. An increase in the white blood cells that may be produced during an allergic reaction (eosinophils) may mean that a condition such as asthma is causing the symptoms.

All the individual cell counts are within the normal limits, thereby, it correlates with the findings of Corre et al\textsuperscript{10}. This finding again reinforces the fact that unlike lungs\textsuperscript{11}, there is no localized tissue injury to provoke any significant deviation of blood cell counts from the normal range.

According to a survey conducted by F. Corre et al\textsuperscript{10} in France on 4,265 men who smoked, had an average blood leucocytes count was found to be 5,705 cells/cu.mm. It has been observed by the same authors\textsuperscript{10,}, that a smoker who is not inhaling smoke is equivalent to a non-smoker. Among 1,603 smokers, who were not inhaling smoke had an average Leucocyte count of 6,064 cells/cu.mm of blood, but rest of the smokers (1,580) who were inhaling smoke had an average total Leucocyte count of 7,047 cells/cu.mm. A study of differential counts among non-inhaling set of smokers (designated as non-smokers by same set of authors\textsuperscript{10}) and smokers who inhaled smoke, showed that the average neutrophil count in non-inhalers (non-smokers) was 3,340 cells/cu.mm (58\%) and 4,140 cells/cu.mm (63\%) of blood in smokers. The average eosinophil count in non - inhalers (non-smokers) was 143 cells/cu.mm (2.5\%) of blood as compared to 163 cells/cu.mm (2.48\%) of blood among smokers. The average basophil count in non-inhalers (non-smokers) was 15 cells/cu.mm (0.26\%) and 21 cells/cu.mm (0.32\%) of blood among smokers. The average lymphocyte count among non-inhalers (non-smokers) was 1795 cells/cu.mm (31.46\%) of blood as compared to 2059 cells/cu.mm (31.43\%) of blood among inhalers (smokers). The average monocyte count among non-inhalers (non-smokers) was 399 cells/cu.mm (6.99\%) of blood as compared to 588 cells/cu.mm (7.45\%) of blood among inhalers (smokers). Individual white cell counts in smokers and non-smokers hardly showed any significant changes among themselves when compared to normal range of values. This statement also hold good for total Leucocyte count in blood among the same set of subjects.

5. Conclusion
The total leucocyte counts and differential counts in blood among smokers didn’t vary much. So it confirms the fact that there is no provocation to induce a significant rise in the blood counts akin to lungs, as there is no local tissue injury due to smoking.

References: