

A Comparative Study of Hematocrit Values and Blood Viscosity Among Chronic Smokers & Non Smokers

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ABSTRACT

Introduction: Tobacco cigarette smoking is one of the major leading causes of death throughout the world. Smoking has both acute and chronic effect on hematological parameters. The aim of the present study was to assess the extent of adverse effects of cigarette smoking on biochemical characteristics in healthy smokers.

Material and methods: This study included 60 participants, with 30 smokers who had been regularly consuming 11-20 cigarettes per day for at least 5 years and 30 non-smokers as controls. Complete blood cell count was analyzed using a CELL-DYN 3700 fully automatic hematological analyzer.

Results: It was found that the smokers had significantly higher levels of hematocrit and viscosity, as well as a slight elevation in hemoglobin levels. No other significant differences were observed in the measured parameters. Our findings indicate that cigarette smoking leads to a significant increase in red blood cells, hemoglobin, and hematocrit, highlighting the negative impact of smoking on hematological parameters.

Conclusion: This study found that cigarette smoking significantly increases hematocrit, hemoglobin, and viscosity levels, which can increase the risk of cardiovascular complications. Smokers should be made aware of the potential negative consequences of smoking and encouraged to quit, with regular monitoring of hematological parameters being essential to detect any changes.

Keywords: Cigarette Smoking, Hematological Parameters, Healthy Population, Hematocrit, Tobacco, Hemoglobin

INTRODUCTION

Tobacco cigarette smoking is one of the most prevalent and preventable causes of death worldwide. [1, 2] It is also considered an essential public health challenge as it nearly doubles the risk of ischemic stroke and substantially elevates the risk of coronary heart disease. [3, 4] In India, 337 million people above the age of 10 consume tobacco. The World Health Organization predicts that tobacco-related deaths in India may exceed 1.5 million annually by 2030. [5] Smoking cigarettes contain over 4000 harmful chemicals, comprising a number of harmful substances including nicotine, free radicals, carbon monoxide, and other gaseous products. [6, 7] Smoking has both acute and chronic effects on hematological parameters such as white blood cell count, platelet count, and hematocrit. [6] Hematocrit is a reliable index of red blood cells production in blood and enables one to detect various types of anemia. [8] It also helps in calculating other hematological indices like MCV and MCHC. Hematocrit values also indirectly reflect blood viscosity and circulation dynamics. Although some earlier studies have revealed a relationship

between smoking and red blood cell count, [10] there is still debate on the impact of smoking on hemoglobin levels. Some scientists suggest that the rise in hemoglobin level in blood of smokers could be a compensatory mechanism, while others argue that smoking does not increase hemoglobin level in all smokers and this relates to tolerance potential of individual to different kinds of diseases.

Given this, our study aims to compare the blood viscosity and hematocrit values between chronic smokers and non-smokers, and to correlate these findings with cardiovascular diseases. This area of research has not been widely explored in our population. Therefore, it is crucial to investigate the impact of smoking on hematological parameters and its correlation with cardiovascular diseases to understand the true extent of the harm caused by smoking and to take necessary public health measures.

Aim

The main objective of our study is to estimate the hematocrit values among chronic smokers and non-smokers. We aim to assess whether smoking increases or decreases these values and to determine the extent of the effect of cigarette smoking on the hematocrit of blood. Additionally, we aim to correlate the hematocrit values with cardiovascular problems to understand the true impact of smoking on hematological parameters and its correlation with cardiovascular diseases. This research will provide valuable insights into the harmful effects of smoking on the body, and can be used to develop effective public health measures to combat the negative impact of smoking on individuals and communities.

MATERIAL AND METHODS

This study is a cross-sectional study, designed to examine the relationship between cigarette smoking and hematological parameters in a sample of smokers and non-smokers. All participants in this study provided written informed consent to participate. The study was also cleared by the institutional ethical committee. The study included a total of 60 participants, 30 of whom were male smokers

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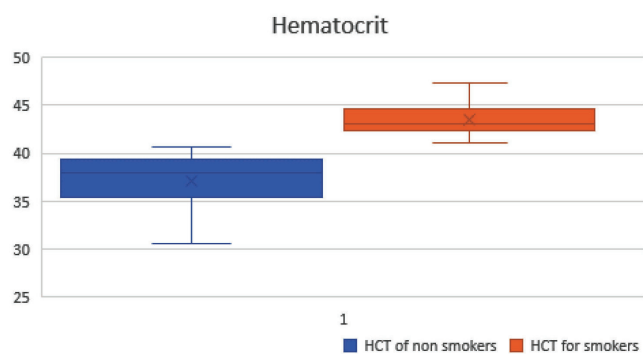


Figure-1: Graph depicting the results of the study

between the ages of 25-40 who have been smoking for at least 5 years, and 30 non-smokers of the same age group. Eligible participants were fully informed about the nature of the tests to be conducted in the study, and blood samples were obtained for the purpose of measuring hematocrit and performing a complete blood cell count. The complete blood cell count was analyzed by CELL-DYN 3700 fully automatic hematological analyzer, which provide accurate and precise results. This study design allows for a fair comparison of hematocrit values between the two groups and can provide insights into the impact of smoking on hematological parameters and its correlation with cardiovascular diseases. The inclusion criteria for this study were as follows: 30 male subjects between the age group of 25-40 years who consume between 11-20 cigarettes per day for at least 5 years.

The exclusion criteria for this study were as follows: subjects with a pre-existing cardiovascular disease, chronic obstructive pulmonary disease (COPD), hematological disorders, a history of drug usage, and those who have donated or received blood in the last 6 months were excluded from the study.

This set of inclusion and exclusion criteria is designed to ensure that the study population is homogenous and that the results of this study can be attributed to the effects of smoking on hematological parameters, and its correlation with cardiovascular diseases.

RESULTS

The study revealed that chronic smokers had significantly elevated hematocrit values compared to non-smokers. This increase in hematocrit may result in higher blood viscosity. Additionally, the study found that smokers had higher levels of hemoglobin and viscosity. However, it is important to note that all other measured parameters did not differ significantly between the two groups. The results of this study demonstrate that cigarette smoking causes a significant increase in red blood cells, hemoglobin, and hematocrit, as evidenced by the statistical analysis ($p < 0.001$ for red blood cells and hemoglobin, and $p = 0.047$ for hematocrit) (Fig 1). These findings suggest that smoking has a significant impact on hematological parameters and may be associated with an increased risk of cardiovascular disease.

DISCUSSION

This study aimed to investigate the effects of cigarette

smoking on hematological parameters, specifically hematocrit (HCT) values. The study included a total of 60 participants, 30 of whom were male smokers between the ages of 25-40 who have been smoking for at least 5 years, and 30 non-smokers of the same age group. The participants were carefully selected to ensure that the two groups were matched for age, sex, and general health status.

The complete blood cell count of the participants was analyzed using the CELL-DYN 3700 fully automatic hematological analyzer. The analyzer is a state-of-the-art instrument that is widely used in clinical laboratories to measure a wide range of hematological parameters, including HCT values. The results of the study were analyzed using statistical methods to determine the significance of the differences between the two groups.

The results of the study indicated that smokers had significantly higher HCT values when compared to non-smokers. This increase in HCT levels was found to be positively correlated with the intensity of smoking, with the heaviest smokers having the highest HCT values. This increase in HCT values can have a number of negative consequences, including an increased risk of cardiovascular complications.

The results of this study align with previous research conducted^[12], which also found that smokers had significantly elevated hematocrit values compared to non-smokers. This consistency in findings further strengthens the evidence that cigarette smoking has a detrimental impact on hematological parameters and may increase the risk of cardiovascular disease. This study adds to the growing body of literature on the negative effects of smoking on health and emphasizes the importance of regular monitoring of hematological parameters, particularly hematocrit, in smokers. The results of this study also highlight the need for increased efforts to educate individuals on the dangers of smoking and to support them in their efforts to quit.

The mechanisms by which smoking affects HCT values are complex and involve a number of different pathways. One of the main mechanisms is through the production of erythropoietin, a kidney hormone that stimulates red blood cell production. When tissues are hypoxic due to increased creation of carboxyhemoglobin, the body produces more erythropoietin which leads to increased erythropoiesis and higher HCT values. Additionally, the carbon monoxide present in cigarette smoke leads to an increase in capillary permeability, which decreases the volume of plasma and mimics the condition of polycythemia, characterized by an increased share of erythrocytes in the blood volume.

The results of this study provide new insights into the negative impact of cigarette smoking on hematological parameters, and particularly on HCT values. The findings of this study suggest that smoking leads to an increase in the number of red blood cells and hemoglobin, which can result in high viscosity and an increased risk of cardiovascular complications. It is therefore imperative that individuals who smoke are made aware of the potential negative consequences of smoking on their health and are encouraged

to quit smoking.

This study also provides important information on the correlation between smoking and hematological parameters and the importance of regular monitoring of these parameters in smokers. The use of the CELL-DYN 3700 fully automatic hematological analyzer ensured the accuracy and precision of the results, adding further credibility to the findings of this study.

CONCLUSION

The results of this study underscore the detrimental effects of cigarette smoking on hematological parameters, particularly on HCT values. The study found that smokers had significantly higher levels of HCT, hemoglobin, and viscosity compared to non-smokers. This increase in HCT levels was positively correlated with the intensity of smoking, indicating that the longer and more frequently an individual smokes, the higher their HCT levels will be. These findings have important implications for the health of individuals who smoke. High viscosity and increased hematocrit levels can lead to a higher risk of cardiovascular complications, such as secondary polycythemia, atherosclerosis, chronic obstructive pulmonary disease, and cardiovascular disease. It is therefore crucial that individuals who smoke are made aware of the potential negative consequences of smoking on their health and are encouraged to quit smoking. Additionally, regular monitoring of hematological parameters in smokers is crucial in order to detect any changes and make appropriate interventions.

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