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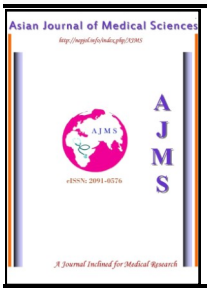

Effect of Cigarette Smoking on Plasma Fibrinogen and Platelet Count

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Abstract

Objective: Cigarette smoking is one of the major lifestyle factors influencing the health of human beings. Fibrinogen is the major plasma protein coagulation factor. Higher plasma fibrinogen concentrations are associated with cardiovascular diseases.

Material & Methods: One hundred twenty healthy male smokers and one hundred twenty healthy male non-smokers among hospital employees and people from surrounding areas of Narayana Medical College, Nellore (India) were studied. The platelet count was done using Beckman Coulter Automatic Analyzer; AcT 5diffCP.Assay for plasma fibrinogen was performed using turbido-metric immunoassay.

Results: The mean plasma fibrinogen concentration for smokers is 3.78 gms/L and for non-smokers 3.02 gms/L. The mean platelet count for smokers is 257325 per mm3 and for non-smokers 215483.3 per mm3. The difference between mean plasma fibrinogen and platelet count of smokers and non-smokers was statistically significant ($p<0.0001$).

Conclusion: Thus we concluded that in smokers plasma fibrinogen concentration and platelet count increase significantly. Regular monitoring of these two parameters in smokers is advised

***Key Words**: Cigarette smoking; Plasma fibrinogen; Platelet count*

1. Introduction

Cigarette smoking is one of the major lifestyle factors influencing the health of human beings. Cigarette smoking is a serious health problem to smokers and to those exposed to it. Lung cancer is the major danger for smokers but diseases of the blood vessels and the heart account for one third of all excess death in smokers.[1]

It is known that cigarette smokers have a high mortality. Smoking is also a major cause of atherosclerotic disease and is considered one of the three major risk factors for coronary heart disease along with high blood pressure and cholesterol disorders. Smoking has both acute and chronic effect on haematological parameters.[2] A cigarette smoker is exposed to a number of harmful substances including nicotine, free radicals, carbon monoxide and other gaseous products. All these substances potentially affect atherogenesis and thrombosis.[3] Nicotine is now speculated to be responsible for development of dependence while carbon monoxide and other combustion substances are responsible for smoking related cardiovascular disorders.[4]

Fibrinogen is the major plasma protein coagulation factor. Low plasma fibrinogen concentrations are associated with an increased risk of bleeding due to impaired primary and secondary haemostasis. Higher plasma fibrinogen concentrations are associated with cardiovascular diseases (>3.43 gms/L).[5]

Several studies on haematology and smoking had been conducted on Caucasian and other ethinic groups, but very less studies done in the past on Indian population. Thus present study was undertaken to find out effect of cigarette smoking on two haematological parameters (Plasma fibrinogen, Platelet count) and to apply this

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information for better investigation and management.

2. Material and Methods

One hundred twenty healthy male smokers and one hundred twenty healthy male non-smokers following an informed consent were studied. Both smokers and controls (non-smokers) were hospital employees and people from surrounding areas of Narayana Medical College, Nellore (India). Both smokers and controls were aged 30-60 years. This cross sectional study was carried out during February–September 2008 at Department of Physiology, Narayana Medical College, Nellore (India) with prior permission of ethical and research committee of Narayana Medical College, Nellore.

Male smokers with frequency of 20 or more cigarette per day with more than 20 year duration of smoking were selected for study. Male smokers with blood pressure 100-140 mm Hg systolic and 60-90 mm Hg diastolic were selected for study. Male smokers had no history of Diabetes mellitus and their random blood sugar was 100-140 mg/dl.

Controls (non-smokers) had no history of Diabetes mellitus and their random blood sugar was 100-140 mg/dl. They had blood pressure 100-140 mm Hg systolic and 60-90 mm Hg diastolic.

Informed written consent was taken from each subject. This study has got permission of ethical and research committee of Narayana Medical College, Nellore (India). Five milliliters of venous blood was withdrawn with minimum stasis into a clean disposable syringe 5 ml. The blood samples were stored in EDTA and trisodium citrate (3.2%) bulbs for platelet count and plasma fibrinogen respectively. The platelet count was done using Beckman Coulter Automatic Analyzer; AcT 5diffCP. Assay for plasma fibrinogen was performed using turbido-metric immunoassay. This immunoassay is based on the principle of agglutination reaction.

Statistical Analysis: The data was entered in computer and analyzed using NCSS statistical package. The differences in means of plasma fibrinogen concentration and platelet count were tested for statistical significance by independent sample “t” test.

3. Results

Table 1 shows the mean, maximum, minimum, standard deviation, and standard error of age, plasma fibrinogen, and platelet count of smokers and non-smokers. The mean plasma fibrinogen concentration for smokers is 3.78 gms/L and for non-smokers 3.02 gms/L. The difference between mean plasma fibrinogen of smokers and non-smokers was statistically significant (p<0.0001).

Table-1: Showing the mean, maximum, minimum, standard deviation, and standard error of age, Plasma fibrinogen, and Platelet count of smokers and non-smokers.

Variable	n	Min.	Max.	Mean	S.D.	S.E.	P Value
Plasma fibrinogen of smokers (gms/L)	120	2.4	4.86	3.78	0.4835	0.0441	<0.0001
Plasma fibrinogen of non-smokers (gms/L)	120	1.92	3.46	3.02	0.3307	0.0302	<0.0001
Platelet count of smokers (per mm^3)	120	103000	421000	257325	58120.73	5305.67	<0.0001
Platelet count of non-smokers (per mm^3)	120	119000	314000	215483.3	34862.03	3182.45	<0.0001
Age of smokers (years)	120	39	56	44.93	4.168	0.3805	0.0646
Age of non-smokers (years)	120	32	56	43.84	4.911	0.4483	0.0646

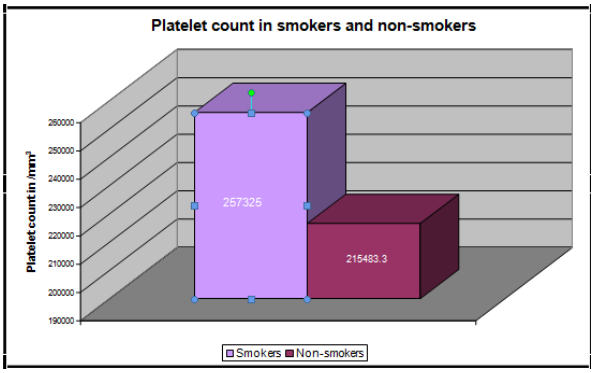

Figure-1: Showing mean platelet count in smokers & non- smokers

The mean platelet count for smokers is 257325 per mm^3 and for non-smokers 215483.3 per mm^3. The difference between mean platelet count smokers and non-smokers was statistically significant (p<0.0001). The mean age for smokers is 44.93 years and for non-smokers is 43.84 years. The difference between mean age of smokers and non-smokers was statistically non-significant (p=0. 0.0646).

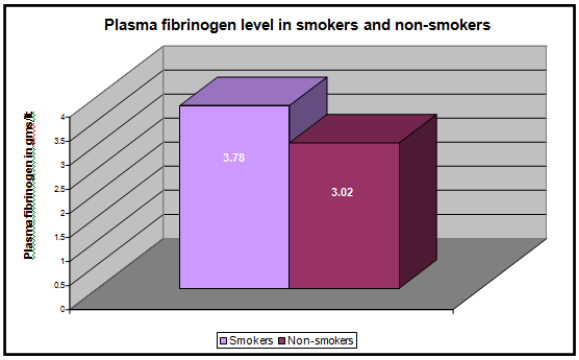

Figure-2: Showing mean Plasma fibrinogen level in smokers & non- smokers

4. Discussion

A large series of studies indicate undoubtedly that smoke inhalation, either active (such as smoking cigarettes) or passive is a potential hazard for daily life and can cause severe lesion to cardiovascular system.[6] Fibrinogen is a classical positive acute phase reactant protein. It is an independent predictor of coronary heart disease events.[5]

In the present study mean plasma fibrinogen concentration of smokers showed sharp increase with respect to the control subjects. The mean platelet count for smoker showed increase with respect to the control subjects. This increase plasma fibrinogen concentration of smokers in the present study is supported by the findings of Subratty et al.[6] They evaluated 100 healthy subjects and compared them with 18 strict smokers. The mean plasma fibrinogen concentration for strict smokers is3.61 gms/L and non-smokers is 3.06 gms/L. The mean platelet count for strict smokers is 256800 per mm^3 and for non-smokers 228000 per mm^3. They conclude that smokers are more at risk of developing thromoboembolic accidents than non- smokers.[6]

Dotevalli A et. al studied 40 young volunteers (20 smokers & 20 non-smokers) with respect to plasma fibrinogen and platelet reactivity. They found plasma fibrinogen levels significantly higher among the smokers as compared to non-smokers.[7]

Frohlich M et. al studied mens and womens aged 25-74 years participating in the third MONICA Augsburg Survey in 1994/95. The mean plasma fibrinogen concentration for smokers is 2.94 gms/L and non-smokers is 2.71 gms/L.Thus this study shows increase in plasma fibrinogen concentration for smokers as compared to non- smokers.[8] Rival J et. al investigated platelet function in 20 healthy smokers and 20 healthy non-smokers. The mean platelet count for smokers is 310800 per mm3 and for non-smokers 278000 per mm3. The data of this study suggests that chronic smoking primes platelet, causing them to aggregate more readily when exposed to an activating stimulus.[9]

Tell GS et. al studied platelet count in Norwegian adolescent population. The mean platelet count for smokers is 300000 per mm3 and for non-smokers 275000 per mm^3. Result of this study show that platelet count was increased in adolescent who started smoking relatively early. Elevation in platelet count in adolescent smokers indicates that these blood components may have an early role in the pathogenesis of arteriosclerosis.[10] It has been proposed that fibrinogen links platelet receptors, which is a precondition for platelet aggregation and also promote hypercoagulable state as well as causes endothelial damage, disorganization and dysfunction.[6]

5. Conclusion

Thus we concluded that in smokers plasma fibrinogen concentration and platelet count increase significantly. Regular monitoring of these two parameters in smokers is advised so that changes can be detected at an earlier stage for implementation of preventive measures such as cessation of smoking. Among subjects at risk of coronary heart diseases, determination of plasma fibrinogen needs to be done routinely.

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