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RESEARCH ARTICLE

EFFECT OF SMOKING ON PLASMAFIBRINOGEN A COMPARATIVE STUDY BETWEEN SMOKERS AND NON-SMOKERS

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ABSTRACT

Background: Plasma fibrinogen is a major determinant of platelet aggregation and blood viscosity. It has been demonstrated that smoking increases the plasma fibrinogen level, which is an independent risk factors for cardiovascular disease. Our objective was to investigate the extent to which cigarette smokers in comparison with non-smokers have their plasma fibrinogen level.

Methodology: A total of 60 Males in the age group of 25 to 50 years with BMI $\leq$24.9Kg/m^2 and without Obesity, any acute infection, diabetes mellitus, hypertension, history of vascular disorders, Consumption of aspirin, lipid-lowering or Fibrinolytic drugs, Overt liver, kidney or thyroid dysfunction were selected and divided into study group with 35 males smoking >5 cigarettes /day for at least 5 years and control group with 25 males .General clinical examination of the subject was done. Two ml of blood was collected and plasma fibrinogen level was estimated by Von Clauss method using a kit named Fibroquant. Statistical analysis was done with student-t-test.

Result: The Mean $\pm$ SD of plasma fibrinogen among smokers (427.83 $\pm$ 57.78) were increased compared to that of the non-smokers (314 $\pm$ 53.08). Results analyzed using student't' test, revealed a statistically very significant 'P' value (P <0.001).

Conclusion: In the present study mean plasma fibrinogen concentration of smokers showed a sharp increase compared to that of the non-smokers. We recommend plasma fibrinogen concentration should be included during the routine assessment of cardiovascular risk in case of smokers.

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INTRODUCTION

Smoking causes 35-40% of mortality due to its causative role in coronary heart disease Smoking is thought to be involved in all stages of atherosclerosis.With this feature into consideration, it has also been proved that smoking increases the plasma fibrinogen. A raised plasma fibrinogen concentration is one of the most common haemostatic system aberration found in smokers. Many studies have been done on plasma fibrinogen and smoking in the Western countries and other ethnic groups. But, only very few studies have been done in the Indian population. So, the objective of this study was to investigate the extent to which smokers in comparison with non-smokers have their plasma fibrinogen level increased and to apply this information for the better investigation and management.

Aim and Objectives

To assess the plasma fibrinogen level in the non-smokers and the smokers. Then to compare the plasma fibrinogen levels between the non-smokers and smokers.

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MATERIALS AND METHODS

We conducted the study in the Institute of physiology and Department of Biochemistry, Government Rajaji hospital, Madurai. Ethical Committee of Madurai Medical College approved the study. A total of fifty subjects in the age group of 25 to 50 years were selected for the study after obtaining a brief history and physical examination. We divided the subjects into two groups based on their smoking habits. Study group consists of 30 healthy subjects with history of smoking more than 5 cigarettes per day for at least 5 years. Control group consists of 20 healthy subjects with no history of smoking. A written informed consent was obtained from all the subjects before starting the study. All subjects were healthy and medication free. Under aseptic precautions, 2ml of venous blood was withdrawn and then transfused into a vacutainer containing 3.2% tri-sodium citrate. This anticoagulant added venous blood was centrifuged. The clear plasma obtained was then transferred in to a clean dry test tube for testing. Plasma fibrinogen level was then determined by Clauss technique using a test kit –named 'Fibroquant' by manual methods by an experienced technician. Fibrinogen concentration was obtained by interpolating the clotting time obtained in seconds, on the

calibration curve drawn on the graph paper provided with the kit used for fibrinogen concentration.

Statistical Analysis

The comparison between the study group (smokers) and the control group (non-smokers) were done by student 't' test using SPSS (Statistical Package for Social Sciences) software, Sigma stat version 3.5. The significance was drawn at P -value of <0.05.

Table 1. Comparison of plasma fibrinogen level among study (smokers) group and control (non-smokers) group

S.No	Parameter	Study group (smokers) (N=30)	Control group (non-smokers) (N=20)	P-value
1	Plasma Fibrinogen	427.83 ± 57.78	314 ± 53.08	0.0001**

Results expressed as Mean ± SD, **P<0.01 is statistically very significant. The Mean ± SD of plasma fibrinogen among smokers (427.83 ± 57.78) was increased compared to that of the non-smokers (314 ± 53.08). Results analyzed using student 't' test, revealed a statistically very significant 'P' value (P <0.001).

Table 2. Relation between smoking index and plasma fibrinogen levels among smokers

S. No	Smoking index	Plasma fibrinogen (mean±sd)
1.	≥ 300	485 ± 63.48
2.	100-299	449.5 ± 43.23
3.	40-99	387.86 ± 31.79

Smoking index is a parameter used to express the cumulative smoking exposure quantitatively. This is especially useful in defining risk ratio of the smoking related disease. The parameter is more suitable to Indian subjects.

Smoking index = No. of cigarettes smoked / day x total duration in (years)

The Mean ±SD of plasma fibrinogen among smokers with smoking index of ≥300, 100 -299 and 40 -99 were 485 ± 63.48, 449.5 ± 43.23 and 387.86 ± 31.79 respectively. This table clearly shows that the plasma fibrinogen concentration increases with increasing smoking index.

DISCUSSION

In the present study mean plasma fibrinogen concentration of smokers showed a sharp increase compared to that of the non-smokers. Many previous studies have also confirmed the role of smoking in increasing the plasma fibrinogen level, a factor which significantly increases the risk of cardiovascular diseases. Folsom A R, in his study has described smoking as an important life style correlate for the plasma fibrinogen. Kristy A Hunter *et al.,* also supported this increase of fibrinogen in smokers. They suggested that the inflammation exhibited by chronic smoking, increases the plasma fibrinogen an acute phase reactant. Stouthard *et al.,* stated that IL-6 the principal procoagulant cytokine was increased in smokers, which increases the synthesis of plasma fibrinogen in smokers. Feher *et al.,* studied thirty chronic smokers 2 weeks before and 2 weeks after cessation of smoking. They found significant reductions in the levels of fibrinogen, blood viscosity and hematocrit after cessation of smoking. Thus, decrease in fibrinogen with smoking cessation proves the causative role of smoking on plasma fibrinogen. Results from the present study also revealed that the plasma fibrinogen levels increased with increasing smoking index, a measure to indicate the dosage of smoking. Ernst E *et al.,* Takayashi *et al.,* Fogari *et al.,* and G.D.O. Lowe, also stated that the smokers show a dose dependent increase in plasma fibrinogen, that is, with the increase in the number of cigarettes smoked the plasma fibrinogen levels also increases. Subratty *et al.,* concluded that smokers were at a greater risk of developing many thromboembolic events comparatively, due to their increased plasma fibrinogen. Lowe GDO *et al*, Ernst and Resch, and many others, stated that the fibrinogen contributes to coronary heart disease by ischemia due to raised plasma and blood viscosity, by atherogenesis and thrombogenesis. Thus, by participating in the formation of atheromatous plaque, fibrinogen is suggested as a causative factor than the result of CHD.

Conclusion

We concluded that the plasma fibrinogen level was significantly increased in smokers. As a result, that plasma fibrinogen concentration is to be included during the routine assessment of cardiovascular risk in case of smokers, so that changes can be detected at an earlier stage for implementation of preventive measures such as cessation of smoking.

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