Effects of Smoking on Serum Lipid Levels in Nascent Young Indian Smokers

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ABSTRACT

AIM: Mortality due to cardiovascular disorders is highest among all non-communicable diseases. Smoking is one of the modifiable risk factors for the development of this condition. Total Cholesterol (TC) and Triglycerides (TG) in serum being independent biomarkers of CVD, this study was designed to analyze and compare their levels between smokers and non-smokers.

MATERIALS and METHODS: The study included 15 smokers who smoked continuously 5-7 cigarettes per day for around 5 years and five non-smokers as controls who were believed to be void of other CVD risk factors. Venous blood was collected from the selected individuals and sera was aspirated after centrifugation. The obtained sera were freeze stored and used later to estimate the total cholesterol and triglycerides by standard protocols.

RESULTS and DISCUSSION: The study found that the mean value of TC among smokers and nonsmokers were not different from each other. This may be because the screened populations were nascent smokers and also due to the fact that they were of young age. In case of TG, slightly lower mean value was noticed when compared to that of controls. The reason for this is not clear and requires further studies on more number of smokers in this age group.

CONCLUSION: This study is unique as there are very few literature reports on lipid values among the population in the age group of 20-25 years with approximate 5 years of smoking history. It is inferred here that in this age group, smoking around 5-6 cigarettes does not alter the blood cholesterol and triglyceride levels significantly. However to validate these results it is proposed in future to extend the analysis to more number of samples.

Keywords: Tobacco smoking, serum Total Cholesterol, Triglycerides, Cardiovascular Disease

INTRODUCTION

World Health Organization (WHO) statistics show that the global mortality arising due to cardiovascular diseases was 17.3 million in 2008 [1]. Worldwide, the major risk factors for the development of this disease includes modifiable risk factors like diet and smoking along with partially modifiable ones like hypertension, dyslipidemia, and diabetes mellitus[2]. A large number of epidemiologic studies claim that in both genders, cigarette smoking generally predisposes to the development of atherosclerosis and also increases in the incidence of myocardial infarction (MI) along with fatal coronary artery disease (CAD) [3-5]. The second and third National Family Health Surveys (NFHS) report shed light on the fact that there is a high increase in smoking among young Indians in the age group of 20-35 years [2]. In fact this was found to be one of the leading as well as preventable cause of morbidity in the Indian population [6, 7]. According to estimates by WHO, by the end of this decade, ie., by 2020, more than 1.5 million deaths annually may occur due to tobacco smoke in India[8]. Tobacco usage skews the lipid profile significantly and this has been repeatedly proved and attested by many studies which showed higher serum cholesterol, triglyceride, and low-density lipoprotein (LDL) levels, in combination with lower high-density lipoprotein (HDL) levels [9-11]. More than 4000 constituents have been identified in cigarette smoke and these include many oxidizing substances which may cause major alterations in lipid profiles [12]. Earlier studies have also identified and associated metabolites such as ceruloplasmin, nitric oxide synthase, 15-lipoxygenase, and redox-active metal ions as being involved in the oxidative pathways [13, 14]. Increased lipid peroxidation products among smokers have also been implicated in these processes which result in oxidation of LDL lipids. However, the mechanistic features beneath the interlinking of these pathways leading to the development of CVD is still very much obscure [15, 16] and open to research.

The present work aims to investigate the level of alterations in the serum total cholesterol (TC) and triglycerides (TG) among young smokers, who smoked approximately 5- 7 cigarettes per day for a duration of around 5 years.

MATERIALS AND METHODS

Demography

The study included fifteen smoking men in the age group 20 to 25 years, who smoked a minimum of 5-7 cigarettes per day for about 5 years. Five healthy age and sex matched controls were also chosen. No participants had any history of hypertension, diabetes mellitus or other systemic diseases which predisposed them to endothelial dysfunction. Informed consent was obtained from all the participants for this study which was a part of a project cleared from our Institution's Human Ethical Committee.

Sample Collection and Estimation of serum Total Cholesterol and Triglycerides

5ml of venous blood was collected by venipuncture from all the volunteers, at VIT University Health Centre, for the estimation of total cholesterol and triglyceride levels. The samples were centrifuged at 3000 rpm for 15 minutes and the aspirated serum was used to estimate cholesterol and triglycerides. Kits purchased from Piramal Health Care (DX Cholesterol and DX Triglycerides) were used for the estimation.

RESULTS

The obtained values of TC and TG were calculated and are shown in Fig 1 and Fig 2. The mean levels of TC between the smokers and non-smokers were 168.5 mg/dL and 168.8 mg/dL respectively. In case of TG, the mean level of smokers was 189.6 mg/dL and non-smokers was 183.5 mg/dL (Fig. 3). In both TC and TG levels, the mean values of smokers and non-smokers were not statistically significant. This result shows that smoking 5-6 cigarettes for duration of 5 years has no significant impact on cholesterol and triglyceride levels of the test volunteers. Moreover, the obtained TC and TG levels of smokers were below the permissible limit, which indicates that their levels were under control.

DISCUSSION

Cigarette smoking aggravates the risk of cardiovascular diseases in many ethnic populations [17]. Animal models, which were exposed to tobacco smoke showed increased aggregation of platelets and this is a very important factor for the initiation of atherosclerosis [18]. The major cause for this genesis is thought to be the free radical mediated damage, which sows the seeds of atherosclerosis. Moreover, some epidemiological studies report changes in lipid profiles due to chain smoking [19].

The present study shows the trend in total cholesterol (TC) and triglyceride (TG) levels between young smoking and non-smoking (controls) population. The results of TC and TG highlighted no statistical significance between the screened subjects and further, the values were below the normal range of <200mg/dL. This may be because the selected population comprised of very young smokers who had been smoking a minimum 5-6 cigarettes and for minimum of 5 years continuously. Similar trend in results was observed in a study carried out on Chinese population which reported that cigarette smoking was not associated with dyslipidemia. Other reports conducted on various ethnic populations have also depicted similar results [20-22].

Studies from the past have shown that in general, current smoking will result in increased TC levels and was associated CVD. Further it was shown that smoking cessation decreased TC and lowers risk of abnormal TC [23-25]. The observations in the present study have shown a different result when compared to certain earlier findings. This may probably be due to the fact that the screened populations were a nascent group of smokers of young age group. TC and TG profiles may probably turn abnormal when the subjects smoke more number of cigarettes and over a longer duration of time.

Further, two interesting facts were observed in the study. One among the control (Non Smoker 3) showed a slight elevation in the levels of cholesterol and TG compared to that of other controls. When investigated further, it was found that he was a passive smoker. There are several studies in past which have shown that passive smoking can modify lipid profiles deleteriously [26]. The other noteworthy fact was the TG levels of some smokers were found to be lesser than that of the controls, for which the reason is not clearly understood.

In conclusion, the study showed the trend in levels of TC and TG of smokers with the smoking of 5 to 7 cigarettes per day for period of around 5 years did not show any statistically significant difference and were also within the permissible range. However a limitation of this study was the small number of samples and a narrow age group. It is understood that further investigations are required on a larger population and a wider range of age group of smokers. This would definitely help in a better understanding of variations in both the TC and TG levels among the young age chain smokers.

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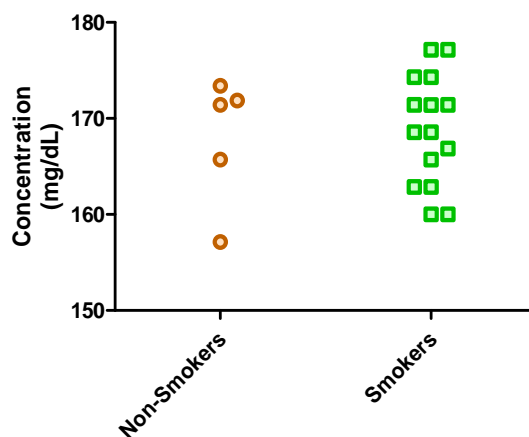
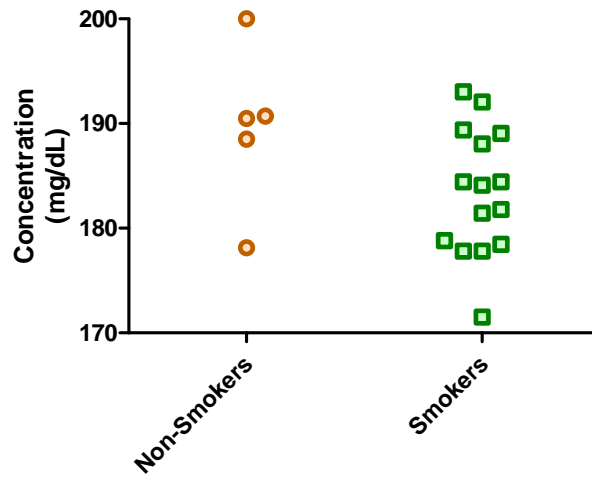Fig 1: Total cholesterol levels of smokers and nonsmokers

Fig 2: Triglyceride levels of smokers and nonsmokers

Total Cholesterol levels
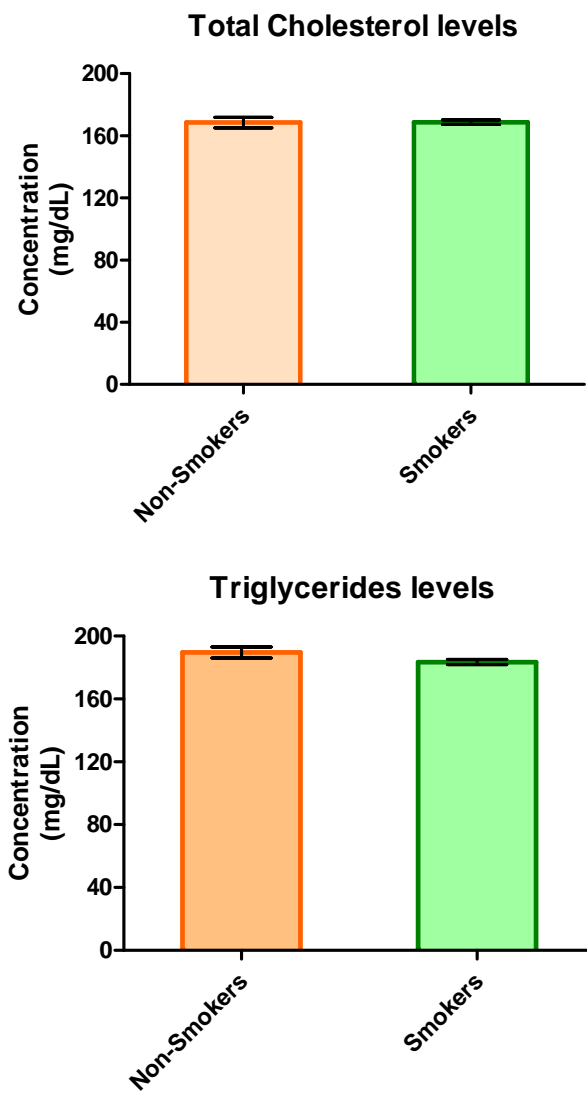

Triglycerides levels

Fig 3: Mean Values of total cholesterol and Triglyceride levels of smokers and nonsmokers