

THE COMPARATIVE STUDY OF LIPID PROFILE IN YOUNG SMOKERS AND NON-SMOKERS BETWEEN 20-40 YEARS

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Abstract

Background: Smoking has a predominant role in premature atherosclerosis particularly among males in South Asian countries. The exact mechanism by which smoking accelerates atherosclerosis is not known. The objective is to find out the status of the fasting lipid profile among smokers and non-smokers.

Materials and Methods: An observational study was designed to carry out the work at Mahatma Gandhi Medical College and Research Institute, Pondicherry. A total of 50 smokers and 50 non-smokers belonging to the age group of 20 to 40 years were included after ruling out exclusion criteria. A detailed history, clinical examination, serum lipid profile, and other relevant laboratory investigations were done. Appropriate statistical methods were applied to analyse the results. **Result:** On analyzing the results, the serum Total cholesterol, LDL, VLDL, and TGL levels in smokers were 245.58±39.79, 171.04±35.18, 43.74±10.56, 217.26±42.15, respectively, compared to non-smokers whose values were 147.64±18.29, 86.16±15.22, 15.30±5.51, 127.40±10.56, respectively, which were statistically significant with $p < 0.001$. The HDL tended to decrease in smokers (30.82±3.41) compared to non-smokers (46.16±4.97) with a statistical significance of <0.001 . **Conclusion:** From the study it can be concluded that smoking adversely affects the lipid profile, therefore increasing the risk of cardiac event among smokers. The study also proves that there is a linear increase in atherogenic lipids and a decrease in protective HDL cholesterol, which is directly proportional to the duration and extent of smoking and pack per years.

INTRODUCTION

Coronary artery disease (CAD) is one of the major causes of mortality and morbidity worldwide.^[1] Lifestyle changes are a major contributing factor to the increased incidence of coronary artery disease.^[2] Risk factors of coronary artery disease can be divided into modifiable and non-modifiable risk factors. 2. Among the modifiable risk factors, smoking plays the predominant role in almost all low- and high-income countries,^[3] other well-studied modifiable risk factors of coronary artery disease include obesity, sedentary lifestyles, dyslipidemia, hypertension, diabetes mellitus and metabolic syndrome.^[4]

Cigarette smoking not only causes coronary artery disease, but it is also a major risk factor for causing cancer, chronic obstructive pulmonary disease and cerebrovascular disease.^[5] This study was conducted to investigate the role of smoking in increased lipid

profile, which eventually lead to coronary artery disease, in young adults between 20 and 40 years, who were nonalcoholic, euglycemic, normotensive, who did not have family history of lipid disorders and who were not on any lipid-altering drugs.^[6-10] This study was conducted among patients availing the Master Health Check-Up provision at the Mahatma Gandhi Medical College and Research Institute. Mahatma Gandhi Medical College and Research Institute a tertiary care centre in Puducherry.

MATERIALS AND METHODS

An observational study was designed to study fifty apparently healthy male smokers and fifty healthy non-smokers. All subjects hailed from mid-socio-economic status and were between 20 and 40 years of age. All subjects were those who attended the master health check-up program in Mahatma

Gandhi Medical College and Research Institute, Pondicherry. The work was carried out after pursuing an approval from Institutional ethical board, and an informed consent from participants.

Case group

Inclusion criteria

- Candidates who have been smoking only cigarettes for at least 1 year
- Age between 20 and 40 years

Exclusion criteria

- History of alcohol abuse
- History of diseases like hypertension, diabetes mellitus, hepatic impairment, renal disease, thyroid disease and obesity
- Use of beta blockers, lipid-lowering drugs, diuretics, steroids or of any other that influence lipid profile.
- Not satisfying the age criteria.
- Adopting any physical activity that influence on lipid profile.

Control group

Inclusion criteria

- Candidates who are non-smokers
- Age between 20 and 40 years

Exclusion criteria

- Candidates who are smokers or alcoholics
- Candidates with diabetes mellitus, hypertension, hepatic impairment, renal disease, thyroid disease and obesity.
- Candidates on drugs like beta blockers, lipid-lowering drugs, diuretics or any other drugs that influence lipid profile.

Methodology

All subjects of both study and control groups, who met the inclusion and exclusion criteria were selected from the master health check-up program in Mahatma Gandhi Medical College and Research Institute between May 2011 and April 2013. Subjects were selected after taking a detailed history, following which a physical examination and laboratory investigations, such as hemoglobin, total count, differential count, erythrocyte sedimentation rate (ESR), fasting blood sugar (FBS), post-prandial blood sugar, serum creatinine, urine analysis, thyroid profile, fasting lipid profile and electrocardiogram were carried out.

Statistical Analysis

Descriptive and inferential statistical analysis was carried out in the present study. Continuous variables were presented as Mean±SD and categorical variables were presented as number (%). Analysis of variance (ANOVA) was done to find statistical significance between continuous variables of three or more groups of patients; Student's T test (two tailed, independent) was used to find the statistical significance of continuous variables of two groups. Inter group analysis was done on metric parameters. P<0.05 is considered statistically significant.

RESULTS

Out of 50 smokers, 10 (20%) individuals were between 21 and 25 years, 19 (38%) of them were between 26 and 30 years, 14 (28%) of them were between 31 and 35 years and 7 (14%) of them were between 36 and 40 years. Thus the age of individuals in the smoker group ranged from 21 to 40 years, and thus the mean age of Group I (smokers) was 29.96±4.86 years. Out of 50 non-smokers, 10 (20%) individuals were between 21 and 25 years, 23 (46%) were between 26 and 30 years, 10 (20%) were between 31 and 35 years and 7 (14%) were between 36 and 40 years. The age of the individuals in non-smoker group ranged from 21 to 40 years and the mean age of those in Group II (non-smokers) was 29.34±4.72 years. [Table 1]

The mean serum total cholesterol in 50 smokers was 245.58±39.79 and in non-smokers was 147.64±18.29. This shows a significant (P value of <0.001) elevation of serum total cholesterol among smokers when compared to non-smokers. The mean serum LDL levels among smokers and non smokers were 86.16±15.22 and 171.04±35.18, respectively, with a P value of <0.001. This difference shows a significant elevation of serum LDL among smokers when compared to non-smokers. The mean triglyceride levels in controls and cases were 127.40±10.56 and 217.26±42.15, respectively, with a P value of <0.001. This shows a significant elevation in serum triglyceride levels among smokers when compared to non-smokers. [Table 2]

Out of 50 smokers, 8 individuals were smoking for 1 to 2 years, their mean serum total cholesterol was 207.13±12.37; 23 individuals were smoking for 3 to 5 years, their mean serum total cholesterol was 238.39±28.82 and 19 individuals were smoking for 6 to 10 years, their mean serum total cholesterol was 270.47±43.12. The mean total cholesterol of 50 smokers was 245.58±39.79 with a P value of <0.001, which shows a significant elevation in serum total cholesterol level with increase in years of smoking. Out of 50 smokers, 8 individuals were smoking for 1 to 2 years, their mean serum triglyceride level was 177.5±11.36; 23 individuals were smoking for 3 to 5 years, their mean serum triglyceride level was 205.17±22.55 and 19 individuals were smoking for 6 to 10 years, their mean serum triglyceride level was 248.63±47.31. [Table 3]

Out of 50 smokers, 4 individuals were smoking 1 to 5 cigarettes per day with a mean serum total cholesterol of 209.5±20.94; 17 individuals were smoking 6 to 10 cigarettes with a mean serum total cholesterol of 235.29±27.46, another 17 individuals were smoking 11 to 15 cigarettes per day with a mean serum total cholesterol of 232.88±32.02 and 12 individuals were smoking 16 to 20 cigarettes per day with mean total cholesterol of 290.17±35.94. [Table 4]

Table 1: Age distribution of patients

Age in years	Smokers		Non-Smokers	
	No	%	No	%
21-25	10	20.0	10	20.0
26-30	19	38.0	23	46.0
31-35	14	28.0	10	20.0
36-40	7	14.0	7	14.0
Total	50	100.0	50	100.0
Mean ± SD	29.96±4.86		29.34±4.72	

Table 2: Comparison of lipid parameters in the two groups studied

Lipid parameters in mg/dl	Smokers	Non-Smokers	P value
Total cholesterol (mg/dl)	245.58±39.79	147.64±18.29	<0.001**
LDL (mg/dl)	171.04±35.18	86.16±15.22	<0.001**
HDL (mg/dl)	30.82±3.41	46.16±4.97	<0.001**
VLDL (mg/dl)	43.74±10.56	15.30±5.51	<0.001**
TGL (mg/dl)	217.26±42.15	127.40±10.56	<0.001**

Table 3: Mean Lipids according to YOCS

YOCS	No. of patients	Total Cholesterol	LDL	HDL	VLDL	TGL
1-2	8	207.13±12.37	144.63±10.82	28.38±2.2	34.13±2.64	177.5±11.36
3-5	23	270.47±43.12	169.91±30.74	30.57±3.12	37.96±6.2	205.17±22.55
6-10	19	270.47±43.12	183.53±41.14	32.16±3.64	54.79±6.4	248.63±47.31
Total	50	245.58±39.79	171.04±35.18	30.82±3.41	43.74±10.56	217.26±42.16
P value	—	<0.001**	0.028*	0.024*	<0.001**	<0.001**

Table 4: Mean Lipids according to number of cigarettes

No. of cigarettes / day	No. of patients	Total Cholesterol	LDL	HDL	VLDL	TGL
1-5	4	209.5±20.94	146.5±19.97	29.5±3.11	33.75±0.5	180.25±27.22
6-10	17	235.29±27.46	168.65±25.87	30.53±3.64	36.24±5.04	198.35±22.7
11-15	17	232.88±32.02	151.94±29.88	30.88±3	49.94±7.99	209.29±27.65
16-20	12	290.17±35.94	209.67±26.71	31.58±3.92	48.92±12.43	267.67±43.96
Total	50	245.58±39.79	171.04±35.18	30.82±3.41	43.74±10.56	217.26±42.16
P value	—	<0.001**	<0.001**	0.734	<0.001**	<0.001**

Table 5: Mean Lipids according to pack per year

Pack per year	No. of patients	Total Cholesterol	LDL	HDL	VLDL	TGL
<1	8	202.12±10.38	139.25±10.70	28.62±3.11	34.75±0.5	175.25±22.22
1-2.9	16	236.87±43.10	167.87±23.83	31.37±3.64	45.56±5.08	202.37±23.7
3-5.9	14	237.28±45.12	169.71±26.77	30.42±3.8	46.9±6.82	210.42±26.65
6-8.9	9	282.42±40.10	196.22±28.72	32.55±3.85	53.22±10.48	257.68±40.82
9-10	3	333.66±38.72	244.26±38.18	34.32±3.42	62.66±11.56	323.66±42.16
Total	50	<0.001**	<0.001**	0.734	<0.001**	<0.001**

Out of 50 smokers, 8 individuals were having a smoking history of <1 pack per year with a mean serum total cholesterol of 202.12±10.38; 16 individuals were having a smoking history of 1- 2.9 pack per year with a mean serum total cholesterol of 31.37±3.64, another 14 individuals were having a smoking history of 3 -5.9 pack per year with a mean serum total cholesterol of 169.71±26.77, 9 individuals were having a smoking history 6-8.9 pack per year with mean total cholesterol of 196.22±28.72, 3 individuals were having a smoking history 9-10 pack per year with mean total cholesterol of 244.26±38.18. [Table 5]

DISCUSSION

In this study, 50 individuals were included in the study group along with an equal number in the control group. The study group consisted of individuals who were smokers who had been smoking at least for 1 year. The control group was non-smoking individuals. Individuals in both groups

were normotensive, euglycemic, with no dyslipidemia or family history of dyslipidemia and with a normal BMI.

In a similar study by Afroz Afshan et al,^[11] with 50 individuals as controls (non-smokers) and 50 individuals as cases (smokers), individuals smoking 10 cigarettes per day for at least 2 years were included in the study. All the individuals were from 21 to 40 years of age with the average age-wise distribution of subjects in smokers and non-smokers being 29.15±5.91 and 33.8±5.15 years, respectively. This study had an unequal age distribution between the study and control groups, and the majority (56% of smokers) was in the age group of 31 to 40 years, which constitutes an extreme age range distribution. Due to the unequal age range distribution in the majority of individuals, it is possible that the results were affected in a negative way.

In another study by Zamir Ahmad et al,^[12] 50 non-obese smokers who smoked more than ten cigarettes per day regularly were selected along with 30 non-obese non-smokers included as controls. Individuals

with diabetes, hypertension and those with history of angina were not included in the study. The number of individuals in the control and study group was not equal and a specific age limit was not considered, which would have affected the specificity of the result.

In the present study, lipid profile and duration of smoking were compared in smokers and non-smokers. In the study conducted by Zamer Ahamed et al,^[12] however, the duration of smoking was not taken into consideration. In the present study, changes in lipid profile according to the number of cigarettes smoked per day were studied. Smokers were divided into four groups (1 to 5 cigarettes/day, 6 to 10 cigarettes/day, 11 to 15 cigarettes/day, 16 to 20 cigarettes/day), and according to the number of cigarettes smoked per day, values of serum total cholesterol, were, respectively, 209.5±20.94, 235.29±27.46, 232.88±32.02, 290.17±35.94 with a P value of <0.001.

In the study conducted by Afroz Afshan et al,^[11] the number of cigarettes smoked per day was considered in two groups: 10 cigarettes per day and >10 cigarettes per day, and in these two groups, the total cholesterol values observed were 191±30 and 259±32, respectively, (P <0.001), LDL values were 112±26 and 161±24, respectively, (P <0.05), VLDL values of 25±13 and 28±13 were observed, respectively, (with P value of 0.132), while the measured TGL levels in the two groups were 169±40 and 185±48 (P value of <0.01). The HDL values in the study were 39.7±2 and 33.5±3, respectively (P <0.05).

In the present study, changes in lipid profile according to the pack per year were studied. Smokers were divided into five groups (<1 pack per year, 1 -2.9 pack per year, 3- 5.9 pack per year, 6 - 8.9 pack per year and 9 – 10 pack per year) and according to pack per year, values of serum total cholesterol 202.12±10.38, 236.87±43.10, 237.28±45.12, 282.42±40.10 and 333.66±38.72., were, respectively, with a P value of <0.001. In the same study, the levels of LDL 139.25±10.70, 167.87±23.83, 169.71±26.77 196.22±28.72 244.26±38.18 in the above-mentioned groups were respectively, with a P value of <0.001. The VLDL values in the five groups were, 34.75±0.5, 45.56±5.08, 46.9±6.82, 53.22±10.48, 62.66±11.56 respectively, with a p value of <0.001 which is statistically significant. The TGL values in the four groups were 175.25±22.22, 202.37±23.7, 210.42±26.65, 257.68±40.82, 323.66±42.16 respectively, with a p value of <0.001, which is statistically significant. But HDL values in the mentioned groups were 28.62±3.11, 31.37±3.64, 30.42±3.8, 32.55±3.85, 34.32±3.42, which shows a suggestive statistical significance. In any other similar studies pack per year was not considered as a parameter.^[12-15]

The study has few limitations like the statistical analyses carried out on the collected data were based on the self-reported smoking habits and the

self-reported age of the individuals. This could possibly limit the significance of the results of this study. Both the study and control groups were randomly selected. The results of the present study cannot be generalized to the entire population because of the small sample size. In the present study, the subjects belonged to a local geographic location, the results of this study cannot be extrapolated to the entire race of the subcontinent. All the 50 smokers included in the study were males and so data on possible gender-based variations of the effect of cigarette smoke on lipid profiles could not be gathered. The possibility of Passive smoking in non smokers was not evaluated. The study was conducted only among the individuals of age group between 20 – 40 years. Effect of drugs and pharmacological agents were not evaluated.

CONCLUSION

The study showed a linear increase in the levels of all serum lipids except HDL-C lipoproteins (smokers, 30.82±3.41; non-smokers, 46.16±4.97) . HDL-C shows a decrease in the serum levels with an increase in the duration and severity of smoking. The study showed a linear increase in Total Cholesterol, LDL, VLDL and TGL with increase in duration and number of cigarettes per day, whereas the HDL showed a reduction with increase in duration and number of cigarettes per day. Healthy smokers, included in the study, were found to be at risk of IHD due to the above changes in lipid profile. The observations done in this present study are in concordance with the data published in India and abroad.

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