

## INFLUENCE OF CIGARETTE SMOKING ON LIPID PROFILE IN PATIENTS CORRELATING TO CORONARY ARTERY DISEASE IN GOVERNMENT GENERAL HOSPITAL, GUNTUR

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**ABSTRACT: BACKGROUND:** A prospective study was carried out to find percentage of dislipidemia among smokers in comparison with non-smokers. To study the alteration of lipid profile among smokers and non-smokers to see any dose related changes (No. of cigarette per day) and duration related changes (No. of years of smoking). To find out the association between lipid levels and smoking among patients admitted in CCU with ischemia or infarction proven by coronary angiogram. **MATERIALS AND METHODS:** 25 non-smokers, 25 smokers, 50 patients admitted to G.G.H. Guntur College were included in this study. Serum lipid profile was analysed in all the subjects. The labeling of dislipidemia was done according to NCEP guidelines.

	Smokers (n=25)	Non smokers (n=25)
The mean	TC 201.4±26.6	164.2±27.1
The mean	TG 190.9±47.1	141.5±26
The mean	HDL 34.9±5.2	42.0±4.0
The mean	LDL 128.3±29.2	92.2±22.3

The dyslipidemia was directly proportional to the dose (No. of cigarettes) and duration of smoking. In IHD patients, with smoking, the mean TC(212.6±34.4), mean TG(181.9±47.7), mean LDL(143.8±37.8), mean HDL(36.6±5.0), when compared to mean TC(207.3±35.1), mean TG(163.8±51.9), mean LDL(133.4±39), mean HDL(36.8±5.9) in non-smokers with IHD. Dyslipidemia was directly proportional to the severity and duration of smoking. Because of above changes in lipid profile, IHD is more common in smokers when compared to non-smokers. **CONCLUSION:** Increase in total cholesterol, triglycerides and low density lipoproteins were noted in all age groups with history of smoking. Whereas high density lipoproteins showed invasive relationship. These changes are directly proportional to the severity and duration of smoking. Smokers with IHD were found to have high levels of TC, LDL and low levels of HDL, when compared to non-smokers with IHD. Healthy smokers were found to be at a risk of IHD due to above changes.

**KEYWORDS:** Lipid profile; Smokers; IHD (Ischemic heart disease).

**INTRODUCTION:** Smoking has a particularly large impact in the developing world and annually accounts for many million deaths worldwide.<sup>1</sup>

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Smoking is the single most important risk factor for coronary artery disease and it is the most preventable cause of preventable diseases and premature deaths. Several possible explanations have been offered for this association of which one is through its dyslipidemic effects.<sup>2</sup>

Coronary artery disease (CAD) is the most common form of heart disease and single most important cause of death in the young. The reduced blood supply is the main cause and it occurs as a result of coronary atherosclerosis. Among the many risk factors associated with the development of atherosclerosis, the principle cause is dyslipidemia. Various studies have shown that Low Density Lipoprotein (LDL) and Very Low Density Lipoprotein (VLDL) are atherogenic and High Density Lipoprotein (HDL) is a protective factor against it. Several studies have shown the association of smoking with increased levels of LDL, triglycerides and decreased levels of HDL. Thus smoking which is a risk factor for atherosclerosis is a major cause of coronary artery disease.

The present study was designed to evaluate the levels of Total Cholesterol, triglycerides, HDL and LDL in relation and comparison in smokers and non-smokers and also their association with coronary artery diseases.

Studies had revealed the pathophysiology of dyslipidemia in smoking in association with coronary artery disease with a six fold increase in cardio vascular mortality in those possessing this disorder. The increased risk of morbidity and mortality associated with smoking makes it essential that there be a clear understanding of the consequences of smoking for the allocation of health care and research resources and for other purposes. Data regarding the prevalence of dyslipidemia in smokers from this part of the country is scanty and conclusions are drawn based on the studies done in northern India. Indian population is non-homogenous and data specific to this region in a dire necessity which this study aims to address.

This study was conducted in a large teaching hospital with a medical college fully equipped cardiology department with cath lab facility and located in the heart of Andhra Pradesh there by attracting representative population from all areas especially the lower strata of society. Results of this study are therefore relevant to the general public of this part of the country. By examining the prevalence of dyslipidemia in smokers with established coronary artery disease. This study aims to create awareness regarding smoking so that by early intervention, this menace could be tackled effectively.

### OBJECTIVES:

1. Comparative study of lipid profile in smokers and non-smokers.
2. To study variable patterns of lipid profile in terms of duration and severity of smoking.
3. To find out the association between lipid levels and smoking among patients admitted in CCU with CAD proven by coronary angiogram (Without any other cause of dyslipidemia).

**MATERIALS AND METHODS:** The present study was carried out in 100 subjects all the subjects were those who attended Government General Hospital, Guntur.

#### 1. 25 NON-SMOKERS:

##### I. Criteria for inclusion

- a. Those who never smoked.
- b. Non obese healthy.

## II. Criteria for exclusion

- a. Those on diet restriction
- b. Those on any drugs known to alter lipid profile e.g.: Beta blockers, Thiazides, Statins etc.
- c. Those with ischemic heart disease, hypertension or any systemic disease which may alter lipid metabolism e.g.. Diabetes, Renal failure, Hypothyroidism etc.

## 2. 25 SMOKERS:

### I. Criteria for inclusion

- a. Those who were non obese healthy
- b. Those who smokes, divided into Depending on severity of smoking.

**Mild smokers:** Regularly between 1-10 cigarettes or beedies /day.

**Moderate Smokers:** Regularly between 11-20 cigarettes or beedies/day.

**Heavy Smokers:** Regularly > 20 cigarettes or beedies/day.

### Depending on duration of smoking

- Between 1-10 years of duration.
- Between 11 - 20 years of duration.
- 20 years of duration.

### II. Criteria for exclusion:

- a. Those on diet restriction.
- b. Those on any drugs known to alter lipid profile e.g. Beta blockers, Thiazides, Statins etc.
- c. Those with ischemic heart disease, hypertension or any systemic disease which may alter lipid metabolism e.g., Diabetes, Renal failure, Hypothyroidism etc.

Both cigarette smokers and beedi smokers were included in the study. The results of the present study were assimilated into tables. These were compared with those of control. The variables were Total Cholesterol, Triglycerides, Low density Lipoproteins, High density Lipoproteins and HDL-c/TC ratio, numbers of cigarettes /day and duration of smoking in years.

## 3. 50 patients admitted to the CCU:

### I. Criteria for Inclusion:

- a) Those with ischemic heart diseases evidenced by CAG.
- b) Both smokers and non-smokers.

### II. Criteria for exclusion

- a) Those on diet restriction
- b) Those on any drugs known to alter lipid profile e.g. Beta blockers, Thiazides, Statins etc.
- c) Those with hypertension or any systemic disease which may alter lipid metabolism e.g. Diabetes, Renal failure, Hypothyroidism etc.

Smoking is less prevalent among females In India. So this study was conducted in male patients.

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### RESULTS:

#### TOTAL CHOLESTEROL:

Age in years	Control (25 subjects)		Smokers (25 subjects)	
	No. of Persons	TC (mg/dl)	No. of persons	TC (mg/dL)
21-30	8	151.6+13.3	6	186.5+19.3
31-40	5	173.4+24.2	7	195.6+27.9
41-50	7	161.4+28.7	5	212.7+27.8
51-60	5	179.0+39.6	7	212.1+26.9

**TABLE 1: ESTIMATION OF TOTAL CHOLESTEROL VALUE**

(Comparative values TC in smokers & non-smokers of different age groups).

The controls in this study had total cholesterol 163.2 +/- 26.0 mg/dl when compared to 202.7±26.5 mg/dL in smokers (P< 0.001). Total cholesterol in smokers with ischemic heart disease was 218.3 +32.4 mg/dL which was significant when compared with controls (P<0.001). A comparison between TC levels in smokers with IHD and in those without IHD did not show any significance. When TC levels in IHD patients 205.2+31.4mg/dl were compared with that of controls it was significant (P< 0.001). This showed a definite relationship of high TC levels with IHD. When values of TC levels among smokers and non-smokers with IHD were compared, it was found to be high among smokers with IHD (P. <0.001).

The observations mentioned above showed that patients with IHD had raised TC levels when compared to the controls.

This shows that there is a direct association between TC level and risk of ischemic heart disease. Similar changes in TC levels were noted among healthy smokers. So this study showed that the smokers without heart disease are at a high risk of coronary artery disease

#### HIGH DENSITY LIPOPROTEIN CHOLESTEROL:

Age in years	Control (25 subjects)		Smokers (25 subjects)	
	No. of Persons	HDL(mg/dl)	No. of persons	TC(mg/dL)
21-30	8	43.1+3.3	6	39.9+6.7
31-40	5	45.9+2.3	7	32.2+4.3
41-50	7	39.1+2.3	5	34.7+4.4
51-60	5	40.5+5.3	7	32.5+1.9

**TABLE 2: ESTIMATION OF HIGH DESITY LIPOPROTEIN CHOLESTEROL VALUE**

(Comparative values of HDL in smokers & non-smokers of different age groups).

A comparative study of HDL-c in smokers 34.9+/-5.2mg/dl when compared with controls 42.0+/-4.0 mg/dL showed that the values were significantly low in smokers (P<0.001). The HDL-c in

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smokers with ischemic heart disease was  $36.6 \pm 5.0$  mg/dL, when compared with controls it showed a significant decrease in smokers with IHD ( $P < 0.001$ ). A comparison between healthy smokers and smokers with IHD did not show any significant difference in HDL-c levels. When HDL-c levels in IHD patients  $36.7 \pm 5.4$  mg/dL were compared with controls, it had shown a significant decrease in the levels ( $P < 0.001$ ). Similarly when smokers and non-smokers with IHD were compared, it did not show any significant difference in HDL-c levels these results show that there is a definite relationship between low levels of HDL- c. and IHD. The decrease in HDL-c levels in smokers place them at a higher risk for coronary artery disease.

### LOW DENSITY LIPOPROTEINS:

Age in years	Control (25 subjects)		Smokers (25 subjects)	
	No. of Persons	LDLc (mg/dl)	No. of persons	TC(mg/dL)
21-30	8	80.6+9.5	6	111.5+28.4
31-40	5	98.6+18.2	7	124.5+26.1
41-50	7	89.0+25.3	5	140.0+29.9
51-60	5	108.8+29.3	7	138.1+30.4

**TABLE 3: ESTIMATION OF LOW DENSITY LIPOPROTEIN CHOLESTEROL VALUE**

(Comparative values of LDL in smokers & non-smokers of different age groups).

The controls in the study had LDL levels of  $92.2 \pm 22.3$  mg/dL. When smokers with LDL levels  $128.3 \pm 29.2$  mg/dL were compared with controls significant increase was noted ( $P < 0.001$ ). The smokers with IHD  $143.8 \pm 37.8$  mg/dL showed a definite increase in the LDL value compared to controls ( $P < 0.001$ ). A comparison between healthy smokers and smokers with IHD did not reveal any significant difference. Comparison between IHD patients ( $138.2 \pm 38.4$  mg/dL) with-controls showed significant increase of ( $P < 0.001$ ).

This comparison also showed that healthy smokers had high LDL levels similar to that of patients with IHD which keeps them at a higher risk for coronary artery disease.

### TRIGLYCERIDES:

Age in Years	Control (25 subjects)		Smokers (25 subjects)	
	No. of Persons	Triglycerides (mg/dL)	No. of persons	TC (mg/dL)
21-30	8	141.4+32.1	6	175.4+47.8
31-40	5	145.1+21.8	7	189.7+52.4
41-50	7	128.0+17.0	5	190.6+64.3
51-60	5	157.1+25.7	7	205.6+31.3

**TABLE 4: ESTIMATION OF TRIGLYCERIDE VALUES**

(Comparative values of triglycerides in smokers & non-smokers of different Age groups)

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Triglyceride levels in healthy smoker's 190.9+/-47.1 mg/dL when compared to controls 141.5+/-26.0 mg/dL showed that there is an increase in the levels. Patients with IHD had elevated levels of TG 173.5+50.0 mg/dL when compared with controls (p<0.005). Smokers with IHD also had elevated levels of TG when compared to controls. The findings of this study showed that there is an Increase in TG levels in healthy smokers when compared to controls and it did have some association in causation of coronary artery disease.

High Density Lipoprotein Cholesterol / Total Cholesterol Ratio.

Age in Years	Control (25 subjects)		Smokers (25 subjects)	
	No. of Persons	TC (mg/dl)	No. of persons	TC (mg/dL)
21-30	8	0.28+0.01	6	0.22+0.05
31-40	5	0.27+0.03	7	0.17+0.02
41-50	7	0.25+0.04	5	0.16+0.02
51-60	5	0.23+0.04	7	0.15+0.03

**TABLE 5: HIGH DENSITY LIPORPOTEIN CHOLESTEROL/TOTAL CHOLESTEROL RATIO**

(Comparative values of HDLc/TC in smokers & non-smokers of different age groups.

High TC levels and low HDL-c levels are associated with the development of coronary artery disease. Hence a ratio of HDL-c / TC was compared in order to assess the risk for the disease. When values of healthy smokers 0.17 +/- 0.03 were compared with controls it showed that there is a significant decrease among healthy smokers (p<0.001). The smokers with IHD 0.17 +/- 0.04 when compared with controls 0.26 +/- 0.03 it was found to be significantly low (p<0.001). When a comparison is made between healthy smokers and smokers with IHD no significant difference was noted. Comparison of IHD patients 0.18 +/- 0.04 with controls showed a significant difference In the ratio (p<0.001). Mild difference was noted when smokers and non-smokers with IHD were compared each other.

The findings of this comparison showed that there is a significant relationship between decreased HDL-c/TC ratios with IHD. The risk for coronary artery disease was found to be high among healthy smokers because of lowered HDL-c/TC ratio in them.

Lipid Profile	No. of cigarettes/day		P-Value
	1-10	11-20	
TC	191.4+20.6	210.8+20.8	0.07,NS
TG	175.1+38.5	205.5+50.9	0.11, NS
HDL	35.4+6.4	34.4+4.0	0.65 NS
LDL	120.9+26.8	135.1+30.6	0.23 NS
HDL/TC	0.19+0.05	0.16+0.03	0.15 NS

**TABLE 6: LIPID RPOFILE IN SMOKERS ACCORDING TO THE SEVERITY OF SMOKING**

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Lipid	No. of years of smoking			P-value
	1-10(7)	11-20(7)	>20(11)	
TC	182.7+20.3	202.9+23.3	212.4+27.2	<0.05,S
TG	182.3+47.4	178.7+52.0	204.1+44.4	0.48, NS
HDL	38.2+7.6	34.7+4.1	32.9+2.8	0.11,NS
LDL	109.0+27.5	132.4+20.8	138.6+30.2	0.08,NS
HDL/TC	0.21+0.50	0.17+0.02	0.16+0.02	<0.05,S

**TABLE 7: LIPID PROFILE IN SMOKERS ACCORDING TO DURATION**

(Comparative values of HDL in smokers & non-smokers of different age groups).

Variable	Non smokers (25)	Mild/Moderate smokers <10 cig/day(12)	P-value	Severe smokers > 10 cig/day(13)	P- value
TC	164.2+27.1	191.4+20.6	<0.01	210.8+28.8	<0.01
TG	141.5+26.0	175+38.5	<0.01	205. +50.9	<0.01
HDL	42.0+4.0	35.4+6.4	<0.01	34.4+4.0	<0.01
LDL	92.2+22.3	120.9+26.8	<0.01	135.1+30.6	<0.01
HDL/TC	0.26+0.03	0.19+0.05	<0.01	0.16+0.03	<0.01

**TABLE 8: LIPID PROFILE: COMPARISON BETWEEN NON-SMOKERS AND DIFFERENT GROUPS OF SMOKERS DEPENDING ON SEVERITY OF SMOKING**

Variable (lipid profile)	Non Smokers (25)	Mild smokers 1-10 yrs (7)	P- Value	Moderate smokers 11 20 yrs (7)	P- Value	Severe smokers > yrs (11)	P- Value
TC	134.2+27.1	182.7+20.3	NS	202.9+23.3	<0.01	212.4+27.2	<0.001
TG	141.5+26.0	182.3+47.4	<0.01	178.7+52.0	<0.01	204.1+44.4	<0.001
HDL	42.0+4.0	38.2+7.6	Ns	34.7+4.1	<0.001	32.9+2.8	<0.001
LDL	92.2+22.3	108.0+27.5	NS	132.4+20.8	<0.001	138.6+30.2	<0.001
HDL/TC	0.26+0.03	0.21+0.05	<0.05	0.17+0.02	<0.001	0.16+0.02	<0.001

**TABLE 9: COMPARISON OF LIPID PROFILE LEVELS BETWEEN NON – SMOKERS AND DIFERENT GROUP OF SMOKERS ACCORDING TO DURATION OF SMOKING**

	No. of subjects	TC	TG	HDL	LDL	HDL/TC
I-Non-Smokers (control)	1	164.2+27.1	141.5+26.0	42.0+4.0	92.2+22.3	0.260+0.03
II smokers	2	201.4+26.6	190.9+47.1	34.9+5.2	128.3+29.2	0.175+0.03

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IHD	IIIa smokers	3	212.6±34.4	163.8±51.9	36.6±5.0	143.8±37.8	0.177±0.04
	IIIb non smokers	4	207.3±35.1	181.9±47.7	36.8±5.9	133.4±39.0	0.182±0.04
	III IHD	5	209.7±34.5	173.5±50.0	36.7±5.4	138.2±38.4	0.180±0.04
	ANOVA	F	10.02	4.24	6.74	9.02	22.16
		P	<0.001	<0.01	<0.001	<0.001	<0.001
Diff between groups (pvalues)	IVs II		<0.01	<0.01	<.001	<0.01	<0.001
	IVs III		<0.001	<0.05	<0.01	<0.001	<0.001
	IIVs III		NS	NS	NS	NS	NS
	IIIa Vs IIIb		NS	NS	NS	NS	NS
	IIVs IIa		NS	NS	NS	NS	NS
	IVs IIIa		<0.001	<0.01	<0.001	<0.001	<0.001

**Table 10: Comparison of Lipid Profile Levels Between Different Groups**

Several trials have determined the importance of controlling the risk factors especially smoking in primary and secondary prevention. However, smoking remains number one preventable cause of cardiovascular disease worldwide.<sup>[3,4,5]</sup>

The most common vessel involved in all subgroups was LAD(41.6%) followed by LCX(29.3%) then RCA(25.9%) and lastly LMS(3.2%) with no significant difference except in case of LCX artery involvement in which there was a significant statistical difference among subgroups( $p < 0.01$ ). Similar results concerning common vessels involvement were revealed by other researchers like Shunji et al and Tewari et al.<sup>[6,7]</sup>

**CONCLUSION:** Increase in Total Cholesterol, Triglycerides and Low Density Lipoproteins were noted in all age groups with history of smoking, whereas High Density Lipoproteins showed an inverse relationship.

A direct relationship exists between severity and duration of smoking with an increase in Total Cholesterol, Triglycerides and Low Density Lipoproteins. High Density Lipoproteins showed an inverse relationship.

Increased levels of TC, TG, LDL and decreased levels of HDL were found to be significant among those with Ischemic Heart Disease.

Smokers with IHD were found to have high levels of TC, LDL, and low levels of HDL when compared to non-smokers with IHD.

HDLc/TC ratio was found to be lower in those with IHD and this could be used to assess the risk for coronary artery disease in particular individual.

Healthy smokers were found to be at a risk of IHD due to these above changes. The observed values were in concordance with studies done in India and abroad.

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