

## A Comparative Study of Serum LDL-Cholesterol in Smoker and Non-Smoker Healthy Adults

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### Abstract:

**Background:** Several studies have reported elevated blood cholesterol levels among persons who regularly smoke cigarettes/beedis and lowered blood cholesterol levels among persons quitting smoking. Other studies have also shown that smoking increases low density lipoprotein cholesterol (LDL-C) level, resulting in an increased risk of coronary heart disease. The **objective** was to Comparative study of serum LDL-C in smokers and non-smokers & correlation with number cigarettes/beedis smoking/day.

**Methods:** An observational cross-sectional comparative study was carried out in 100 subjects. The subjects were divided into two groups. First group consisted of 50 nonsmokers and second group of 50 smokers. The group of 50 smokers was again divided into three sub groups which mild (1-10 cigarettes/day), moderate (11-20 cigarettes/day, severe (more than 20/day) with at least 5 years or more duration of smoking. Concentration of serum LDL-C was determined by Beta-quantification determination of LDL -C concentration.

**Results:** there was statistically significant difference among smokers and nonsmokers aged 18 to 45 years with normal BMI & significant positive correlation with number of beedis/cigarette smoking with respect of serum LDL-C.

**Conclusions:** Thus, it can be said based on the present study that smoking affects LDL-C of the healthy adults which leads to cardiovascular risk in future.

**Keywords:** serum LDL-C & Cigarette smoking.

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### Introduction

Cigarette/beedis smoking epidemic is one of the biggest public health problems, the has ever faced killing 7 million peoples in a year. world smoking is the single most important preventable cause of illness and death. There is an increasing incidence of mortality due to cigarette/beedis smoking as compared to other causes of death like alcohol, addictive drugs and suicides. The association has been so strong and so, consistent that smoking is now considered as a definitive cause of cardiovascular disease. Tobacco smoking user who dies prematurely deprive their families, raise the cost of health care and hind the economic development [1].

In India the effects of smoking could be even more harmful than western countries because of wide spread practice of smoking beedis which is more harmful than cigarettes and frequently smoked by villagers.

Several studies have reported elevated blood cholesterol levels among persons who regularly smoke cigarettes/beedis. Other studies have also

shown that smoking lowers high density lipoprotein level (HDL-C), resulting in an increased risk of coronary heart disease. Smoking also leads to increase in LDL cholesterol. Even exposure to environmental tobacco smoke i.e. passive smoking results in decreased levels of HDL cholesterol demonstrated in children of smoker parents by Rosenses. Many studies have shown a dose dependent relationship between smoking and serum lipid profile [2].

The mechanism by which cigarettes/beedis smoking alters the lipoprotein metabolism is not clear. The various mechanisms postulated are stimulation of sympathoadrenal system by nicotine leading to lipolysis and increased serum free fatty acid level which leads to increased synthesis of VLDL from liver. Increased consumption of free fatty acid by heart leads to increased myocardial oxygen demand. Repressive action of smoking on the oestrogen level which in turn lead to decreased HDL cholesterol. Smoker is thought to consume a

diet rich in fat and cholesterol and poorer in fibre and cereals [3].

Nicotine stimulates secretion of catecholamine leading to activation of adenylyl cyclase enzyme of adipose tissue resulting in increased lipolysis, increased concentration of plasma free fatty acids (FFA), increased secretion of hepatic free fatty acids and hepatic triglycerides along with VLDL cholesterol in the blood stream [4].

The plasma concentration of cholesterol and of its main component LDL cholesterol are established risk factor for the incidence of atherosclerotic vascular disorders. Epidemiological studies have also consistently demonstrated that serum concentration of HDL-C is inversely correlated with the incidence of coronary artery disease. Human HDL is a heterogeneous mixture of lipoprotein particle comprising of two principal subfractions, HDL2 and HDL3. A widely held view is that the benefit of HDL is linked to HDL2. With this background, present study has been undertaken to study the effect of smoking on LDL-C between smokers and nonsmokers its correlation intensity of smoking in Indian healthy adults [5].

### Aims and Objective

**Aims:** - To aware smokers, the hazards of smoking and discourage tobacco usage in any form

### Objective

1. Effect of smoking on LDL-Cholesterol in healthy smokers
2. Compare of serum LDL-Cholesterol level in smokers and nonsmokers
3. Effect of severity of smoking on serum LDL-Cholesterol

### Material & Methods

#### Study Place and Design

This study was carried out in clinical Biochemistry Lab, RNT Medical college Attached M.B. hospital Udaipur over a period of one year from November 2017 to November 2018. It is observation cross sectional study, total of 100 subjects (50 controls & 50 smokers) was taken from general public, patients' attendants, hospital; staffs and medical college students of RNT Medical College Udaipur.

After ethical clearance from institutional ethical committee, written consent was taken, detail history and physical examination was done all subjects

#### Inclusion Criteria

1. Age from 18 to 45 years
2. Both sex (Male and Female)
3. The subjects were all having BMI in between 18.5-24.9

4. The subjects were taking Average Indian diets

The subjects were divided into four groups.

- (a) Non-smokers: subjects who have never smoked and those who left at least more than 5 years smoking taken as controls
- (b) Mild Smokers: -01-10 cigarettes/beedis per day for at least 5 years or more
- (c) Moderate Smokers: - 11-10 cigarettes/beedis per day for at least 5 years or more
- (d) Heavy Smokers: -More than 20 cigarettes/beedis per day for at least 5 years or more

#### Exclusion Criteria

1. Age below 18 years and above 45 years
2. Subjects having medical conditions mentioned below known to influence blood lipids were excluded

-Diabetes Mellitus  
-Nephrotic syndrome  
-Alcoholism  
-Hypertension

Subjects who were on following drugs

HMG CoA reductase inhibitors  
Fibric acid derivatives  
Nicotinic acid  
Beta blockers  
Diuretics  
Steroids

3. Subjects who were on diet restriction

**Procedure:** -Venous blood was collected by using sterile disposable syringe by taking all universal precautions. Later serum was separated from them. Concentration of serum LDL-C was determined by Beta-quantification determination of LDL -C concentration. • the tests were carried out in RxL Max Siemens Fully Auto Analyzer. Serum glucose estimated by hexokinase method & serum creatinine estimated by modified Jaffe's method done also in RxL siemens analyzer. urine sugar and protein estimated in cobas urine analyser

Statistical analysis the data was recorded and analysed using the statistical package for social science software system (SPSS, VERSION 16). Data were described using the mean and standard deviation (Mean +2SD) for significant difference between two groups. Student's t-test was applied to compare the mean values between the two groups and if it was found that the p value was less than 0.05 (<0.05), it was taken as statistically significant. In Addition, ANOVA test was performed to find the difference of these parameter among three group of smoking intensity.

#### Results

In the present study 50 smokers and 50 non-smokers subjects were studied for their serum

LDL-C concentration. The smokers were further divide into three groups based on No. of

cigarettes/beedis/day which is showed in tables given below: -

**Table 1: Distribution of smokers based on number of cigarettes/beedis smoked day**

Groups	No. of subjects	Percentage
Mild smokers 1(-10 cigarettes/beedis/day)	24	48.0
Moderate smokers (11-20cigarettes/beedis/day)	22	44.0
Heavy smokers (>20 cigarettes/beedis/day)	4	8.0
Total	50	100.0

**Table 2: Distribution according age groups in nonsmokers and smokers**

Age group	Case type		Total
	Non smokers	Smokers	
<20 years	7 (14%)	3(6%)	10(10%)
20-30 years	27(54%)	20(40%)	47(47%)
>30 years	16(16%)	27(54%)	43(43%)
Total	50 (50%)	50(50%)	100(100%)

**Table 3: Distributions according to Sex**

Sex	Cases type		Total
	Non-Smokers	Smokers	
Female	10(20%)	2(4%)	12(12%)
Male	40(80%)	48(96%)	88(88%)

**Table 4: Distribution according to duration of smoking**

Duration	Case type No. of smokers
5-10 years	26(52%)
11-15 years	14(28%)
>15 years	10(20%)

**Table 5: comparison of LDL-C(Mean±SD) between smokers and non-smokers**

Parameter	Nonsmokers	Smokers	P values
LDL-C	86.8±23.5	113.2±29.4	p<0.05

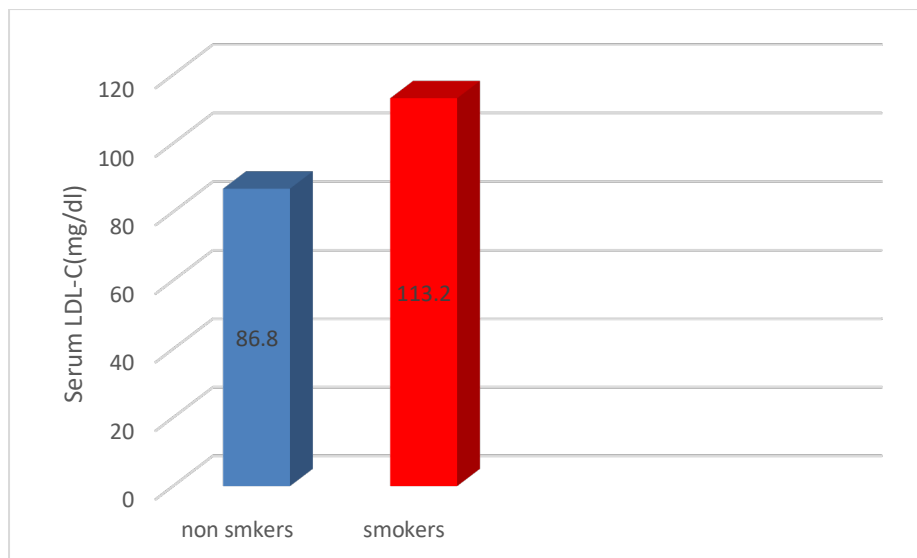
**Table 6: Comparison of LDL-C(Mean±SD) between non-smoker and different groups smokers**

Parameter	Non smokers N-50	Mild smokers (N-24)	Moderate smokers (N-22)	Heavy smokers- (N-4)	P value
LDL-C	86.8±23.5	92.76±11.4	110.5±24.9	136.4±29.5	p<0.05

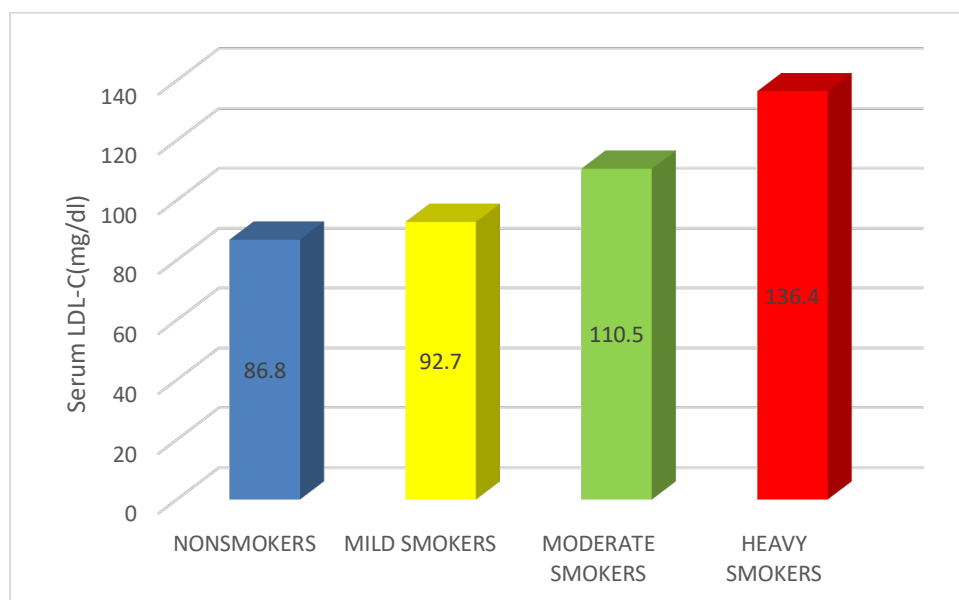
Table 5 Showed comparison of serum LDL-C between smokers and nonsmokers. Mean of LDL were found to be significantly higher among the smokers compared to the nonsmokers ( $p < 0.05$ )

Table 6 shows comparison of LDL-C levels between nonsmokers and different groups of

smokers. It was found that the LDL-C value was not significantly different between mild smokers and nonsmokers( $p>0.05$ ). But for all other groups, it was significantly different( $p<0.05$ ).



**Graph 1: Comparison of LDL-C in nonsmokers and smokers**



**Graph 2: Comparison of LDL-C in nonsmokers and different groups of smokers**

**Discussion**

It is therefore important to identify the potential risk factors early when prophylactic care must be cost effective. Cigarette smoking one of them in a meta-analysis of cigarette smoking and associated change in serum lipid and lipoprotein level in early Age.

Reviewing the Indian scenario a few studies are really outstanding.

A.K. Sinha et al, conducted a study in healthy young male (aged 25 to 35years) cigarette smokers LDL cholesterol (100.2±31.03 mg/dl) were significantly higher in smokers (p<0.05) [6].

Putturaj K.R et al, conducted a study in young smokers (aged 25 -35 years) age and weight matched non –smokers, founded the mean serum

LDL-C was (160.57±30.41 mg/dl) which were higher than nonsmoker but not statistically significant [7].

Rastogi. R et al conducted study in 1989 from Meerut &they observed similar phenomenon as mentioned in the western literature mainly a rising serum LDL-C The change in lipid profile was similar in cigarette and beedi smokers [8].

Ns Nekiet al 2002 reported LDL –C, were significantly higher in smokers thanas compared to non-smokers thereby revealing a direct dose response relationship [9].

Meenakshisundarum et al 2010 reported that abnormalities in lipid profile are directly correlated with smoking and duration of smoking pack years [10].

Alharbiwaheeb D.M. et al 2011 studies the influence of cigarette smoking on lipid profile in male university students and reported that LDL-C and triglyceride were significantly increased in smokers than in non-smokers [11].

Mohammed ABD et al 2016, a cross-sectional study was carried out in Iraq smokers. There was a significant higher level of LDL-C in the smokers group compared to non-smokers ( $p < 0.001$ ). In addition, total Cholesterol and LDL were significantly associated with the number of cigarettes smoked per day ( $p < 0.001$ ) [12].

Juwairia Mohammad et al in 2016, the study was carried out at Hyderabad LDL-C were significantly higher among smokers compared to nonsmokers. Anti atherogenic HDL and uric acid were lower among smokers [13].

Our study showed that LDL-C significantly higher among smokers than nonsmokers ( $p < 0.05$ ) and LDL-C statistically not significant in mild smokers with nonsmokers ( $p > 0.05$ ) but statistically significant in moderate and heavy smoker with nonsmokers ( $p < 0.05$ )

### Conclusion

Cigarettes /beedis is associated with significant higher level of LDL-C in smokers compared to nonsmokers & significant positive correlation with intensity of smoking. It may be concluded that, cigarettes /beedis smoking in young adults increased LDL-C with direction of increased risk for coronary artery disease. So, it is strongly recommended to avoid smoking for the benefit of overall health.

**Limitation:** Sample Size was small, beedis and cigarettes risk correlation with dyslipidaemia needs further studies with larger sample size. Our study was a hospital-based study; it may not represent the whole population.

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