Original Article

Evaluation of Association between Dyslipidemia and Smoking Routine of Smokers in Southern Punjab

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ABSTRACT

Objective: To establish the association between blood lipid levels and smoking and to develop the dose-dependent relationship between smoking habits and dyslipidemia.

Study design: An analytical cross-sectional study.

Place and duration of study: This study was conducted at the Cardiology Department of Ch. Pervaiz Elahi Institute of Cardiology Multan from May 2020 to October 2020 for a period of six months.

Methodology: A total of 150 participants were included in the study who were divided into three groups: smokers, non-smokers, and former smokers based on their responses to the self-designed questionnaire. Additionally, the participants were investigated about their economic situation and physical activity to predict confounding variables. The blood sample of all the participants was then collected and serum levels of high-density lipoprotein, low-density lipoprotein, cholesterol, and triglycerides were measured.

Results: Among the participants, 80 (53.3%) were currently smoking while the lifetime prevalence was 86.3%. Dyslipidemia was significantly greater in smokers (55.1%) than non-smokers (37%) or formal smokers (43%). The majority of smokers (42, 52.5%) were within the age bracket of 40-50 and largely belonged to the lower class (39, 48.7%) and reported moderate physical activity, in terms of MET (41, 51.25%). As for dose-response association, the significant association developed between no of cigarettes and blood High-density lipoprotein and triglycerides level in current smokers while in former smokers risk was high for high-density lipoprotein [OR, CI (1.85, 0.7-1.2)], low-density lipoprotein (1.47, 1.2-2.9), and cholesterol (1.22, 0.9-1.7).

Conclusion: It is concluded that smoking significantly disturbs the body level of lipids. Moreover, the smoking dose holds a variable relationship with the different components of the blood lipid profile.

Keywords: Dyslipidemia, smoking, cigarette, Cholesterol, high-density lipoproteins, low-density lipoproteins, triglycerides.

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INTRODUCTION

It is well-established that that dyslipidemia enhances the probability of occurrence of cardiovascular diseases (CVD) [(1)]. It is the underlying cause of more than half of fatalities in different regions [(2)]. Given the strong evidence of its effects on CVD, the intact metabolic pathway fats in the body are important [(3)]. Dysregulation in any component of the pathway leads to the development of long-lasting non-communicable diseases[(4)].

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The prevalence rate of dyslipidemia is generally associated with ethnicity, cultural, economic, and social components of society and their living style.

Undoubtedly, many risk factors of dyslipidemia have already been well-established. However, the studies predict that several are still unknown [(5)]. Due to this inadequate knowledge, no completely effective therapeutic plan could be introduced. Factors including body mass index, age, alcohol intake, and physical activity are usually considered as risk factors for dyslipidemia [(6)]. Similarly, smoking is also believed to be a potential agent for change in blood lipid levels. Although to date, no study could build a definite relationship between the two [(7)], some have predicted that cigarette smoking can affect the level of blood lipids through nicotine absorptions which alter the functioning and metabolism of body lipids [(8)]. It has been reported by some researchers that nicotine enhances total cholesterol, triglyceride, LDL cholesterol (LDL-C), and reduces HDL cholesterol (HDL-C) while others noted that it reduces total cholesterol, LDL-C, HDL-C, and multiplies the level of triglyceride [(9)].

In addition to the role of smoking in developing heart diseases and lung cancer, it is also believed as a causative agent of several non-communicable chronic health issues[10]. Moreover, several other health conditions are linked with tobacco intake because of its potential to disturb the immune system and physical condition of the smoker. However, no consensus could be built on the association between smoking and dyslipidemia [11,12]. Therefore, the study is conducted to establish an association between blood lipid levels and smoking among smokers in the southern part of Punjab.

MATERIALS AND METHODS

An analytical cross-sectional was conducted at the Cardiology Department of CPEIC Multan for six months from 3rd May 2020 to 3rd October 2020. A total of 200 patients, who visited the outdoor patient department (OPD), were initially shortlisted through random sampling technique. For the final selection of the participants of the study, patients were passed through the following inclusion criteria: those who were in the age bracket from 30-60 years; being the resident of the same area from at least past 1 year; and who willingly signed the informed consent to participate in the study. Whereas, to limit the influence of confounding variables, participants with high blood pressure, renal failure, diabetes, hepatitis, and dyslipidemia medication were excluded from the study.

For assessment of the smoking habits, the number and duration of smoking were considered. Based on smoking character, Participants were classified into three groups: non-smokers, former smokers, and smokers. The assessment of the smoking habit was based on self-reporting of the participants. Smokers were characterized as those who smoked minimum hundred cigarettes, and were currently smoking regularly; non-smokers were those who claimed to smoke less than the minimum criteria of 100 cigarettes, while the participants who reported to quit smoker and had a history of at least 100 cigarettes were classified as former smokers [12]. Similarly, socioeconomic status was assessed through the administration of a specially designed questionnaire, and the subjects were divided into the lower class, middle class, and upper class. Similarly, another questionnaire evaluated the physical activity status of the participants. Based on the responses and other associated variables, the metabolic equivalent of task (MET) of every activity was calculated. Physical activity status was categorized as low (23.5-37.5 MET-hours every week), moderate (37.7-45.0 MET-hours every week), and heavy (MET greater than 45 hours every week) [13]. After the initial assessments, participants' blood was collected in a fasting state according to the protocol. The serum was separated and the lipid profile was run on an automated analyzer. For the analysis of results, dyslipidemia was characterized as triglycerides (TG) greater than 200 mg/dL, total cholesterol ≥240, low-density lipoprotein (LDL) ≥160 mg/dL, and high-density lipoprotein (HDL) less than 40 mg/dL (14).

Statistical Analysis: The data was analyzed was using SPSS version 20.0. All the qualitative data were presented as a percentage. The association between smoking-dose and probability of abnormal lipid levels were presented through odd ratio (OR) within 95% confidence interval. For all the calculations, $p< 0.05$ was considered statistically significant.

RESULTS

A total of 160 were eligible for the study. Out of which, 100 (62.5%) were male while 60 (37.5%) were female. The majority of participants (76, 51.2%) were aged between 35 to 45 years whereas the majority of smokers (42, 52.5%) were within the age bracket of 40-50. Smokers largely belonged to the lower class (39, 48.7%) and reported moderate physical activity, in terms of MET (41, 51.25%). Additionally, dyslipidemia was significantly greater in smokers (55.1%) than non-smokers (37%) or formal smokers (43%) (Table I).

As for the dose-response association between dyslipidemia and no. of smoked cigarettes, current smokers had a significantly abnormal level of HDL and TG than non-smokers. However, the relation couldn't reach a significant level of total cholesterol and LDL. For instance, the risk of having abnormal HDL was 1.10 and 1.83 higher among those who smoke less than and more than 10 cigarettes, respectively, in contrast to those who don't smoke. However, the distinction couldn't be drawn between smokers and non-smokers in terms of total cholesterol and LDL. Whereas, a significant correlation was found between no cigarettes smoked and blood HDL, LDL, and total cholesterol when former smokers were compared with non-smokers. That is, those who smoked less than 10 cigarettes had 1.85, 1.45, and 1.22 times higher risk of developing abnormal HDL, LDL, and cholesterol, respectively (Table 2).

Table No.1: Baseline Characteristics of the Participants of the Study (N=150)

Variables	Total n=150 (n, %)	Smoker n=80 (n, %)	Former Smokers n=30, (n, %)	No Smokers n=50, (n, %)	p-Value
Gender					
Male	100 (66.6)	78 (97.5)	30 (100)	15 (30)	<0.001
Female	50 (33.3)	2 (2.5)	0 (0)	35 (70)	

Age Group					
30-40	76 (51.2)	23 (28.7)	2 (66.6)	12 (24)	0.04
40-50	48 (32)	42 (52.5)	10 (33.3)	21 (42)	
50-60	23 (15)	15 (18.7)	18 (60)	17 (34)	
Wealth index					
Lower class	70 (46.6)	39 (48.7)	18 (60)	18 (36.6)	0.69
Middle class	45 (30)	25 (31.2)	7 (23.3)	15 (30)	
Upper class	35 (23.3)	16 (20)	5 (16.6)	17 (34)	
Physical Activity (MET-hrs/week)					
Low	39 (26)	13 (16.25)	7(23.3)	5 (10)	0.004
Medium	77 (51)	41 (51.25)	15 (50)	25 (50)	
Heavy	33 (22)	26 (32.5)	8 (26.6)	20 (40)	
No. of Cigarettes/day					
1-10	-	75 (93.7)	-	48 (96)	0.07
>10	-	5 (6.25)	-	2 (4)	
Abnormal HDL					
Yes	106 (61)	46 (57)	14 (46)	21 (42)	P<0.05
No	44 (29)	35 (43)	16 (54)	29 (48)	
Abnormal LDL					
Yes	4 (2.5)	1 (1.25)	1 (3.33)	3 (3.75)	P<0.001
No	146 (97.5)	79 (99)	29 (97)	47 (94)	
Abnormal Cholesterol					
Yes	129 (85.25)	58 (73)	14 (48)	27 (53)	P<0.05
No	21 (14.05)	22 (27)	16 (52)	25 (45)	
Abnormal Triglyceride					
Yes	129 (85.2)	54 (67)	16 (52)	18 (37)	P<0.001
No	21 (14.8)	26 (33)	14 (48)	32 (63)	

Table No.2: Multiple Logistic Regression for Associating Smoking Habits with Dyslipidemia (N=150)

	Variables	HDL OR (95% CI)	LDL OR (95% CI)	TG OR(95% CI)	Cholesterol OR(95%CI)
Current Smokers (regarding non-smokers)					
-	**No. of cigarettes/ day**				
-	1-10	1.10(0.8-1.44)	0.70 (0.62-1.2)	1.54(1.23-2.3)	0.89(05-1.4)
-	>10	1.83 (1.32-2.2)	0.30 (0.5-1.2)	1.70(1.33-2.1)	0.07 (0.05-1.0)
Former Smokers (concerning non-smokers)					
-	No. of cigarettes/ day				
-	1-10	1.85 (0.7-1.2)	1.47 (1.2-2.9)	0.80(0.65-1.3)	1.22 (0.9-1.7)
-	>10	1.67 (1.06-2.3)	2.24 (1.8-2.5)	0.79(0.55-1.8)	1.30 (1.2-2.1)

DISCUSSION

Our study found out 58.4% prevalence rate of dyslipidemia which lies within the range established by previous studies, between 14% to 79% [15]. The purpose of the study was to explore the effect of smoking on blood lipid levels. Thus, the dyslipidemia patients with other comorbidities were excluded to remove the bias.

The prevalence of smoking found in our study is following the review conducted in 2015 [16]. Our study found 53% of smokers within the age bracket of 30-60, where 97.5% were men and around 2.5% were women. The investigation has established a significant relationship between levels of lipids in blood and smoking which was earlier on not proved by a closely related Chinese study [14], probably due to variable sex and age structure of the included population.

Some of the previous studies claimed that nicotine decreases HDL-C, LDL-C, and total cholesterol and elevates triglycerides in the body [17, 18] while others found that smoking multiplies triglyceride, LDL-C, and total cholesterol and reduces HDL-C level (19). These opposing results were also found after matching the potential confounders such as BMI, sex, and age (10). It can be interpreted that such contrast could be due to the relationship between blood lipid levels and other contributing agents such as the use of alcohol or any other intoxicant [10].

Analysis of the findings based on multiple logistic regression revealed that current smokers, smoking 10 cigarettes or more than that, are at higher risk of having

HDL-C abnormalities than non-smokers which in alliance with already established similar literature [20]. Additionally, similar to the findings of previous studies, total cholesterol, and LDC is reported to be higher among the former smokers, who used to smoke up to 10 cigarettes or more than that, in contrast to non-smokers[21].

The regression model also exhibited that the probability of having an abnormal level of LDL-C, total cholesterol, and HDL-C among the former smokers is associated with the number of smoked cigarettes. Thus the observed variations among both current and former smokers enhance with the increase in the amount of nicotine intake.

However, it was astonishing to find that with the rise in the number of cigarettes in former smokers, the risk of HDL-C abnormality decreases as compared to their non-smoker counterparts. It is assumed that it could be possibly due to the adoption of a healthy diet routine or better lifestyle which couldn't be reported in the study or could be exactly deduced from the evaluated factors. This interpretation, however, requires further analytical research and clinical trials.

This study is limited in some aspects as the participants self-reported about their smoking habits, which creates the risk of recall bias in the results. Similarly, the cross-sectional design of the study doesn't allow to explore the causalities due to the relationship between dyslipidemia and smoking.

CONCLUSION

It is concluded that smoking significantly disturbs the body level of lipids. Moreover, the smoking dose holds a variable relationship with different components of the blood lipid profile.

Author's Contribution:

Concept & Design of Study:	Sadia Iqbal
Drafting:	Muhammad Ramzan
Data Analysis:	Azhar Shahzad
Revisiting Critically:	Sadia Iqbal, Muhammad Ramzan
Final Approval of version:	Sadia Iqbal

Conflict of Interest: The study has no conflict of interest to declare by any author.

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