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FREQUENCY OF DYSLIPIDEMIA AMONG SMOKERS ATTENDING A TERTIARY CARE HOSPITAL

Original Research

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ABSTRACT

Background: Dyslipidemia, characterized by abnormal levels of blood lipids, is a major modifiable risk factor for cardiovascular disease and is particularly concerning in individuals who smoke, due to synergistic effects on vascular health. Smoking contributes to lipid abnormalities through oxidative stress and endothelial dysfunction. Understanding the prevalence and contributing factors of dyslipidemia in smokers is essential for early detection and preventive intervention, especially in high-risk populations with increasing tobacco consumption.

Objective: To determine the frequency of dyslipidemia among smokers attending a tertiary care hospital.

Methods: This cross-sectional study was conducted over six months, from March to August 2024, at the Department of Medicine, Akhtar Saeed Trust Hospital, Lahore. After ethical approval and informed consent, 150 smokers aged 20–70 years were recruited using non-probability consecutive sampling. Demographic details, smoking history, lifestyle habits, comorbidities, and dietary patterns were recorded. Blood samples were collected for serum lipid profiling. Dyslipidemia was defined based on established lipid thresholds: total cholesterol >200 mg/dL, triglycerides >150 mg/dL, LDL-C >200 mg/dL, or HDL-C <35 mg/dL. Data were analyzed using SPSS version 25, with chi-square tests applied for significance at $p \leq 0.05$.

Results: The mean age of participants was 48.33 ± 9.27 years. Among 150 patients, 129 (86%) were male and 21 (14%) female. Hypertension and diabetes were present in 30% and 36.7% of participants, respectively. The mean BMI was 28.23 ± 3.77 kg/m², and average smoking intensity was 16.09 ± 3.40 cigarettes/day. Dyslipidemia was identified in 57 patients, yielding a prevalence of 38%. Significant associations were found with sedentary lifestyle (62.1%, $p = 0.002$) and fast-food consumption (51.8%, $p < 0.001$).

Conclusion: Dyslipidemia was commonly observed among smokers, with dietary and lifestyle factors playing a prominent role. Routine lipid screening and lifestyle counseling should be prioritized in this high-risk group.

Keywords: Body Mass Index, Cardiovascular Diseases, Dyslipidemia, Lifestyle, Risk Factors, Smoking, Tobacco Use Disorder.

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INTRODUCTION

Dyslipidemia, defined as an abnormal elevation in blood lipid levels, is a well-established risk factor for cardiovascular morbidity and mortality. It typically manifests as a decrease in high-density lipoprotein cholesterol (HDL-C) alongside elevated levels of low-density lipoprotein cholesterol (LDL-C), triglycerides, and total cholesterol. A multitude of factors, such as increasing age, obesity, sedentary lifestyle, alcohol intake, and tobacco use, contribute to the development and progression of dyslipidemia (1,2). Among these, smoking has been extensively documented as a key modifiable risk factor that not only disrupts lipid metabolism but also accelerates endothelial dysfunction, promoting atherosclerosis and heightening the risk of cardiovascular events and cerebrovascular accidents (3,4). Cigarette smoke introduces reactive oxygen species and free radicals into the bloodstream, which oxidize lipids and initiate vascular inflammation, fostering the development of atheromatous plaques (5). This lipid peroxidation process contributes to structural damage and functional decline of the vascular system, emphasizing the synergistic role of smoking in enhancing the atherogenic potential of dyslipidemia. Although the biological association between smoking and altered lipid profiles is well-acknowledged, evidence from low- and middle-income countries, including Pakistan, remains limited (6,7).

Tobacco consumption in Pakistan is widespread and multifaceted, including the use of manufactured cigarettes, naswar, paan, gutka, and hookah. The growing trend is alarming, with per capita cigarette consumption rising from 292 in 1994 to 406 in 2007. In 2014 alone, 64.48 billion cigarettes were consumed nationwide according to data from the State Bank of Pakistan (8). National estimates show that the age-standardized prevalence of tobacco use stands at 13.4%, with a higher burden observed in urban areas (16.3%) compared to rural regions (11.7%). Gender-wise, tobacco use among men reached 26.1% in urban areas and 24.1% in rural settings, while among women, the prevalence was 7.7% and 3.1%, respectively (9). Despite the high prevalence of smoking and its well-established impact on lipid metabolism, there is a noticeable lack of localized studies exploring the frequency of dyslipidemia among smokers in Pakistan. Existing literature demonstrates varied prevalence rates of dyslipidemia among smokers in different populations, indicating the need for context-specific data to inform public health strategies (10,11). Therefore, this study aims to determine the frequency of dyslipidemia among smokers attending a tertiary care hospital in Pakistan. By generating locally relevant evidence, the findings of this investigation may support the implementation of routine lipid screening among smokers and promote targeted awareness campaigns on the cardiovascular risks associated with tobacco use.

METHODS

This cross-sectional study was conducted over a six-month period from March 2024 to August 2024 at the Department of Medicine, Ghurki Trust Teaching Hospital, Lahore. The study received approval from the Institutional Review Board (IRB-26/12/22-AVC, dated 29 September 2022), and informed consent was obtained from all participants prior to data collection. The target population comprised individuals aged 20 to 70 years of either gender, with a smoking history of more than five pack-years. Participants were either visiting the hospital for medical check-ups or accompanying other patients. A non-probability consecutive sampling technique was used to recruit 150 eligible participants. The sample size was calculated using a 95% confidence interval and an 8% margin of error, assuming the prevalence of dyslipidemia to be 41.7% based on findings in ICU-admitted patients (8). Inclusion criteria encompassed individuals within the specified age range and a smoking history consistent with the operational definition. Exclusion criteria included patients with chronic renal failure (serum creatinine >1.8 mg/dL or those undergoing dialysis), hepatic failure (AST or ALT >40 IU, or history of hepatitis B or C), current or recent use of statins or other lipid-lowering medications, diagnosed cardiovascular diseases, and those with familial hyperlipidemia based on clinical history. These exclusion parameters ensured that confounding conditions affecting lipid metabolism were minimized.

After confirming eligibility, demographic and clinical information was recorded, including age, gender, body mass index (BMI), occupation, duration and type of smoking, number of cigarettes smoked per day, presence of diabetes mellitus (random blood sugar >200 mg/dL), hypertension (blood pressure ≥140/90 mmHg), anemia (hemoglobin <10 g/dL), alcohol intake (>20 mL/day), lifestyle factors (active or sedentary), and dietary habits. Following data collection, venous blood samples (5 cc) were drawn using sterile disposable syringes and analyzed in the hospital's laboratory for lipid profiling. Dyslipidemia was diagnosed based on established

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thresholds: total cholesterol >200 mg/dL, triglycerides >150 mg/dL, LDL-C >200 mg/dL, and HDL-C <35 mg/dL. Patients identified with dyslipidemia were managed using standard hospital protocols. All data were documented in structured proformas and subsequently entered into SPSS version 25 for statistical analysis. Categorical variables such as the frequency of dyslipidemia were presented as percentages. Stratification was performed based on variables including age, gender, BMI, occupation, duration of smoking, diabetes, anemia, hypertension, alcohol consumption, lifestyle, diet, and type of smoking. Post-stratification, the chi-square test was applied to examine associations between these variables and the presence of dyslipidemia. A p-value of ≤0.05 was considered statistically significant.

RESULTS

A total of 150 patients were enrolled in the study, with a mean age of 48.33 ± 9.27 years (range: 32–68 years). The average body mass index (BMI) was 28.23 ± 3.77 kg/m², and the mean duration of symptoms was 7.27 ± 2.89 months. The participants reported smoking an average of 16.09 ± 3.40 cigarettes per day. Of the total sample, 129 (86%) were male and 21 (14%) were female. The prevalence of hypertension and diabetes mellitus was 30% and 36.7%, respectively. Current smokers constituted 60% of the sample, while 40% were ex-smokers. Anemia was present in 24.7% of patients, and alcohol intake was reported by 6.7%. In terms of lifestyle, 31.3% of patients had an active lifestyle, 19.3% reported a sedentary lifestyle, and 49.3% engaged in regular physical exercise. Regarding dietary habits, 14% followed a structured diet plan, 20.7% consumed home-cooked meals, 56.7% frequently consumed fast food, and 8.7% were dependent on mess meals. Occupationally, category O was the most common (56.7%), followed by F (24.7%) and D (18.7%).

The overall frequency of dyslipidemia was 38%, affecting 57 out of 150 patients. Among individuals aged ≤50 years, dyslipidemia was found in 37.5%, and in those aged >50 years, in 38.9% (p = 0.866). Gender-wise, dyslipidemia was present in 38.8% of males and 33.3% of females (p = 0.635). Among patients with BMI ≤25 kg/m², 36.6% had dyslipidemia, whereas among those with BMI >25 kg/m², the rate was 38.5% (p = 0.827). The frequency of dyslipidemia was nearly identical in patients with symptom duration ≤8 months (38.5%) and >8 months (36.6%) (p = 0.827). Patients with hypertension had a lower dyslipidemia prevalence (31.1%) than those without hypertension (41%) (p = 0.255). Dyslipidemia was observed in 40% of diabetics and 36.8% of non-diabetics (p = 0.701). The frequency was slightly higher among current smokers (38.9%) compared to ex-smokers (36.7%) (p = 0.784). Among anemic patients, dyslipidemia occurred in 48.6% compared to 34.5% in non-anemic individuals (p = 0.124). Alcohol consumption was associated with a higher frequency of dyslipidemia (60%) versus 36.4% in those without alcohol intake (p = 0.181).

Statistically significant associations were noted between dyslipidemia and lifestyle habits (p = 0.002) as well as dietary patterns (p < 0.001). Sedentary individuals had the highest frequency of dyslipidemia (62.1%), followed by active individuals (42.6%) and those engaged in regular exercise (25.7%). Dyslipidemia was most prevalent among patients who consumed fast food (51.8%), followed by those on mess meals (38.5%), while lower rates were seen among patients following diet plans (14.3%) and home meals (16.1%). When disaggregated by occupational categories, dyslipidemia was observed most frequently among individuals in occupation group O (44.7%), followed by group D (35.7%) and group F (24.3%). Though the association between occupation and dyslipidemia approached statistical significance (p = 0.099), it did not reach the conventional threshold. A multivariate logistic regression analysis was performed to identify independent predictors of dyslipidemia after adjusting for potential confounders, including age, gender, BMI, hypertension, diabetes, anemia, alcohol intake, lifestyle, dietary habits, and occupation. Among all predictors, alcohol intake emerged as the only statistically significant factor independently associated with dyslipidemia (p = 0.018). Other variables, including BMI, diabetes, and fast food consumption, while clinically relevant, did not reach statistical significance, potentially due to sample size limitations and wide confidence intervals. Furthermore, no significant difference was found in the prevalence of dyslipidemia between current and ex-smokers, nor when stratified by smoking intensity (≤16 vs >16 cigarettes/day), suggesting that cumulative smoking exposure, rather than daily quantity alone, may be a more relevant marker for lipid abnormalities.

Table 1: Descriptive statistics of demographic and life style related factors of the patients

		Frequency	Percent
Age (Years)		48.33±9.27 (32.0-68.0)	
Gender	Male	129	86.0
	Female	21	14.0
BMI (Kg/m2)		28.23±3.77 (22.0-35.0)	

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		Frequency	Percent
Hypertension	Yes	45	30.0
	No	105	70.0
Diabetes Mellitus	Yes	55	36.7
	No	95	63.3
Type of smoker	Current	90	60.0
	Ex	60	40.0
Number of cigarettes per day		16.09±3.40 (11.0-22.0)	
Anemia	Yes	37	24.7
	No	113	75.3
Alcohol Intake	Yes	10	6.7
	No	140	93.3
Occupation	D	28	18.7
	F	37	24.7
	O	85	56.7
Duration of symptoms		7.27±2.89 (3.0-14.0)	
Life Style	Active	47	31.3
	Sedentary	29	19.3
	Exercise	74	49.3
Daily Diet	Diet Plan	21	14.0
	Home Meal	31	20.7
	Fast Food	85	56.7
	Mess	13	8.7

Table 2: Comparison of presence of dyslipidemia between demographic and life style related factors of the patients

		Dyslipidemia		Total	p-value
		Yes	No		
Age Groups	≤ 50	36(37.5%)	60(62.5%)	96(100.0%)	0.866
	>50	21(38.9%)	33(61.1%)	54(100.0%)	
Gender	Male	50(38.8%)	79(61.2%)	129(100.0%0	0.635
	Female	7(33.3%)	14(66.7%)	21(100.0%)	
BMI (Kg/m2)	≤ 25	15(36.6%)	26(63.4%)	41(100.0%)	0.827
	>25	42(38.5%)	67(61.5%)	109(100.0%)	
Duration of symptoms	≤ 8	42(38.5%)	67(61.5%)	109(100.0%0	0.827
	>8	15(36.6%)	26(63.4%)	41(100.0%)	
No. of cigarette/day	≤ 16	34(37.0%)	58(63.0%)	92(100.0%)	0.740
	>16	23(39.7%)	35(60.3%)	58(100.0%)	
Hypertension	Yes	14(31.1%)	31(68.9%)	45(100.0%)	0.255
	No	43(41.0%)	62(59.0%)	105(100.0%)	
DM	Yes	22(40.0%)	33(60.0%)	55(100.0%)	0.701
	No	35(36.8%)	60(63.2%)	95(100.0%)	
Type of smoker	Current	35(38.9%)	55(61.1%)	90(100.0%)	0.784
	Ex	22(36.7%0	38(63.3%)	60(100.0%)	
Anemia	Yes	18(48.6%)	19(51.4%)	37(100.0%)	0.124
	No	39(34.5%)	74(65.5%)	113(100.0%)	
Alcohol Intake	Yes	6(60.0%)	4(40.0%)	10(100.0%)	0.181
	No	51(36.4%)	89(63.6%)	140(100.0%)	
Occupation	D	10(35.7%)	18(64.3%)	28(100.0%)	0.099

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		Dyslipidemia		Total	p-value
		Yes	No		
	F	9(24.3%)	28(75.7%)	37(100.0%)	
	O	38(44.7%)	47(55.3%)	85(100.0%)	
Life Style	Active	20(42.6%)	27(57.4%)	47(100.0%)	0.002
	Sedentary	18(62.1%)	11(37.9%)	29(100.0%)	
	Exercise	19(25.7%)	55(74.3%)	74(100.0%)	
Daily Diet	Diet Plan	3(14.3%)	18(85.7%)	21(100.0%)	<0.001
	Home Meal	5(16.1%)	26(83.9%)	31(100.0%)	
	Fast Food	44(51.8%)	41(48.2%)	85(100.0%)	
	Mess	5(38.5%)	8(61.5%)	13(100.0%)	

Table 3: Occupational Distribution of Dyslipidemia

Occupation Group	Dyslipidemia (n, %)	Total Patients (n)
D	10 (35.7%)	28
F	9 (24.3%)	37
O	38 (44.7%)	85

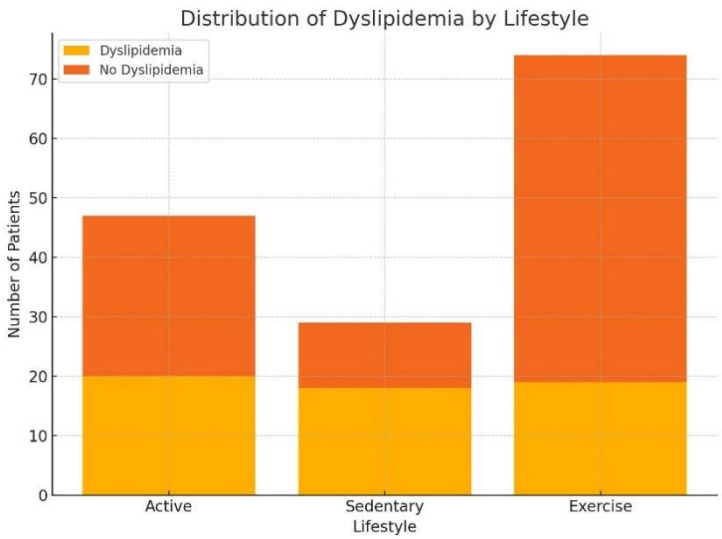


Figure 1 Distribution by Dyslipidemia by Lifestyle

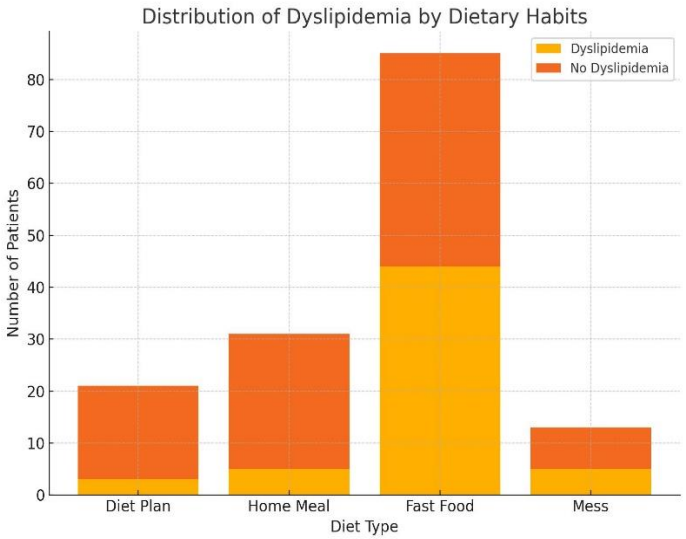
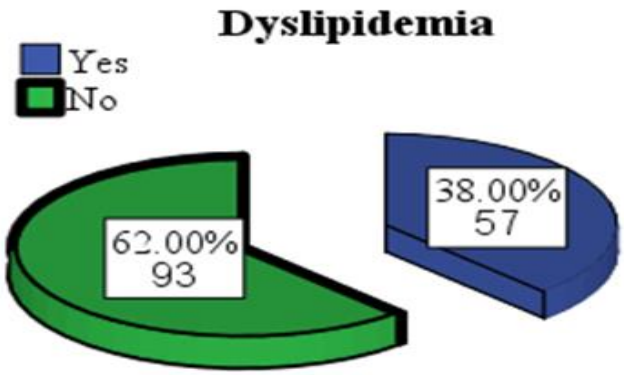


Figure 2 Distribution by Dyslipidemia by Dietary Habit



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DISCUSSION

Dyslipidemia remains a principal modifiable risk factor for cardiovascular disease (CVD), particularly in individuals with diabetes, where it substantially elevates both morbidity and mortality. Early identification and intervention have been recognized as key strategies in public health efforts to mitigate the progression of atherosclerotic disease and associated complications (12,13). The current study revealed a 38% frequency of dyslipidemia among smokers attending a tertiary care hospital, with significant associations observed between dyslipidemia and modifiable lifestyle factors such as dietary habits and physical activity. These findings reinforce the clinical relevance of targeting behavioral modifications in preventive cardiometabolic care. When compared to regional and international literature, the results aligned with studies reporting dyslipidemia prevalence in smokers ranging from 33% to 43%, such as in cohorts from Saudi Arabia, China, and Korea (14-16). However, higher rates have also been documented, including 54.9% among current smokers in Iran and up to 68.1% in Ethiopia, suggesting geographical and population-specific variability potentially influenced by genetic predispositions, dietary practices, and socioeconomic conditions (17,18). Markedly higher prevalence rates of over 80% have been reported in Spain, Tanzania, Nepal, and Thailand, possibly attributed to differences in diagnostic thresholds, sampling methods, and the inclusion of high-risk cohorts (19,20). These disparities underscore the contextual nature of dyslipidemia epidemiology and the necessity of localized research to inform evidence-based clinical strategies.

The current study contributes valuable insight by examining the intersection of smoking with lipid abnormalities in a Pakistani population, particularly among individuals who are young to middle-aged males. It highlighted the detrimental impact of sedentary lifestyles and unhealthy dietary habits—particularly fast-food consumption—on lipid profiles. This observation underlines the importance of comprehensive lifestyle interventions as part of dyslipidemia management programs (21). Despite its strengths, including a clearly defined study population and a structured approach to lipid profiling, the study faced several limitations. Being cross-sectional in design, causality could not be established between smoking and dyslipidemia, limiting temporal inference. Moreover, self-reported data introduced the potential for recall bias, especially concerning smoking habits, dietary intake, and physical activity levels. The study was conducted at a single center, which restricts the generalizability of findings to broader populations. In addition, several confounding variables were not accounted for, including the use of lipid-lowering agents and detailed stratification based on smoking duration or cumulative exposure, which could have influenced the lipid profile outcomes.

Future studies should consider multicenter designs with longitudinal follow-up to assess causality and progression of dyslipidemia in relation to smoking and other risk factors. Expanding the sample size and incorporating biochemical markers of oxidative stress and inflammation may also yield more comprehensive insights into the pathophysiological mechanisms linking tobacco use and lipid dysregulation. Furthermore, adjusting for socioeconomic factors, detailed nutritional assessments, and pharmacologic histories will enhance the robustness and applicability of future research findings.

CONCLUSION

This study concluded that dyslipidemia was notably prevalent among smokers in a tertiary care setting, with strong associations observed between its occurrence and modifiable lifestyle factors such as dietary patterns and physical activity levels. These findings highlight the pressing need for routine lipid screening and targeted lifestyle interventions among smokers to mitigate long-term cardiovascular risks. Emphasizing preventive strategies at the community and clinical levels can play a pivotal role in reducing the burden of dyslipidemia and its related complications in high-risk populations.

AUTHOR CONTRIBUTION

Author	Contribution
Ayla Iftikhar*	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Zafar Iqbal	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Muqaddas	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Ahtisham Ali	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Muhammad Nouman	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Izza Yaseen	Substantial Contribution to study design and Data Analysis Has given Final Approval of the version to be published

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