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Impact of Smoking on Lipid Profiles and Risk of Coronary Artery Disease in Young Adults: A Comparative Study

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ABSTRACT :

Background: Smoking is a significant preventable cause of morbidity and mortality globally, notably as a risk factor for cardiovascular diseases (CVDs) such as coronary artery disease (CAD). Among young adults, the long-term consequences of smoking, including dyslipidemia, remain underexplored.

Objective: This study aimed to investigate the correlation between smoking habits and lipid profile levels among young individuals and assess the potential future risk of CAD.

Methods: A cross-sectional, prospective study was conducted with 100 healthy participants aged 18–25 years. Participants were categorized into smokers (n=50) and non-smokers (n=50). Data on smoking duration and frequency were collected via structured questionnaires. Fasting lipid profiles were analyzed using the ERBA EM360 automated clinical chemistry analyzer. Statistical comparisons were made using independent t-tests and chi-square analysis.

Results: Young smokers exhibited significantly elevated levels of low-density lipoprotein (LDL), triglycerides (TG), and total cholesterol, and reduced high-density lipoprotein (HDL) compared to non-smokers ($p<0.05$). Duration and intensity of smoking positively correlated with worsening lipid profiles.

Conclusion: The findings underscore the detrimental impact of smoking, even in moderate durations and intensities, on lipid metabolism. Early lifestyle interventions and smoking cessation efforts are critical for reducing long-term cardiovascular risk in young adults.

Keywords: Smoking, Lipid Profile, Cardiovascular Disease, Young Adults, Coronary Artery Disease

1. Introduction

Tobacco smoking is a well-established risk factor for cardiovascular diseases (CVD), including coronary artery disease (CAD), myocardial infarction, and stroke. The World Health Organization reports that tobacco use causes more than 7 million deaths annually, with a significant proportion attributed to CVDs [1]. The toxic components of tobacco smoke, including nicotine, carbon monoxide, and oxidizing chemicals, contribute to endothelial dysfunction, inflammation, and atherosclerosis [2].

Lipid profile analysis plays a central role in assessing the risk for CAD. Key components include total cholesterol, low-density lipoprotein cholesterol (LDL-C), high-density lipoprotein cholesterol (HDL-C), and triglycerides (TG). An imbalance in these lipoproteins, especially elevated LDL and TG and reduced HDL, increases the risk of atherosclerotic plaque formation [3].

Nicotine and other tobacco constituents adversely affect lipid metabolism. These substances stimulate lipolysis, increase free fatty acids in circulation, and elevate hepatic VLDL and LDL synthesis [4,5]. Epidemiological data demonstrate that smokers tend to have significantly lower HDL-C and higher LDL-C and TG compared to non-smokers [6].

Understanding how smoking behavior, particularly in youth, alters lipid profiles is crucial for early preventive strategies. This study investigates these alterations and their implications for future cardiovascular health.

2. Objectives

- To evaluate the correlation between smoking habits and lipid profile levels in young adults.
- To compare the lipid profiles of young smokers with those of non-smokers.
- To assess the potential future risk of coronary artery disease based on lipid profile alterations.

3. Materials and Methods

Study Design and Setting: This is a cross-sectional, prospective study conducted at Parul University and Parul Sevashram Hospital, Vadodara, Gujarat. Ethical approval was obtained from the Institutional Ethics Committee (Approval No: PUIECHR/PIMSR/00/081734/5206-A).

Study Population: A total of 100 healthy participants aged 18 to 25 years were enrolled. Participants were divided equally into two groups: smokers (n=50) and non-smokers (n=50).

Inclusion Criteria: - Healthy individuals aged 18–25 years - Willing to provide informed consent

Exclusion Criteria: - History of diabetes, liver disease, kidney disease, thyroid disorders, cancer, alcohol use

Data Collection: Participant data including age, sex, smoking history (duration, intensity) were collected through a Google Form. Fasting blood samples (after 10–12 hours of fasting) were drawn and processed for lipid profile analysis.

Biochemical Analysis: Lipid profiles were measured using the ERBA EM360 Fully Automated Clinical Chemistry Analyzer. LDL cholesterol was calculated using Friedewald's formula [7]:

LDL-C = Total Cholesterol - HDL-C - (TG / 5)

Statistical Analysis: Data were analyzed using SPSS version 22. Independent t-tests and chi-square tests were used to compare lipid parameters between smokers and non-smokers. A p-value < 0.05 was considered statistically significant.

4. Results

Participants were age-matched with no significant differences in demographic variables. Most smokers had smoked for less than 2 years and consumed 3–4 cigarettes per day.

Lipid Profile Findings: - **HDL-C:** Mean HDL was significantly lower in smokers compared to non-smokers ($p<0.05$) - **LDL-C and TG:** Significantly elevated in smokers ($p<0.05$) - **Total Cholesterol:** Higher in smokers, particularly those with longer smoking durations

Smoking duration (>2 years) and cigarette count (>3 per day) correlated with worse lipid outcomes.

5. Discussion

Our findings align with previous research showing smoking's association with dyslipidemia. Li et al. (2019) demonstrated that nicotine and carbon monoxide interfere with lipid metabolism by upregulating LDL and TG synthesis while lowering HDL [8]. Azeem et al. (2020) observed similar patterns among Pakistani youth [9].

Moreover, Herath et al. (2022) reported decreased HDL and increased cholesterol levels in Sri Lankan smokers [10]. These patterns are consistent with mechanisms explained in earlier works, such as Bell and Schwartz (1971), who noted smoking's impact on cholesterol exchangeability and atherogenic potential [11].

Even moderate smoking habits in our study were associated with elevated LDL and TG, indicating that even short-term exposure can pose significant cardiovascular risks.

6. Conclusion

This study confirms a strong correlation between smoking and altered lipid profile levels in young individuals. Given that dyslipidemia is a major contributor to coronary artery disease, early smoking habits may significantly impact future cardiovascular health. Public health efforts should focus on early intervention, lifestyle counseling, and cessation programs targeting youth.

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Ethical Approval: Parul University Institutional Ethics Committee (Approval No: PUIECHR/PIMSR/00/081734/5206-A).

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