

Original Article

Lipid profile alterations in Young Adults using Smokeless Tobacco: A prospective observational study from an urban center in Pakistan.

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Abstract

Background: Smokeless tobacco (ST) use is a prevalent health concern in South Asia, with increasing consumption among young adults. While the association between smoking and cardiovascular diseases (CVDs) is well-documented, the impact of ST on lipid profiles and related cardiovascular risks remains underexplored. This study aims to assess the lipid parameters in young adult ST users to evaluate potential dyslipidemia and its implications for cardiovascular health.

Methodology: This prospective observational study was conducted at Sindh Government Hospital Liaquatabad from November 2021 to April 2022. A total of 100 participants aged 18-30 years, who self-reported regular use of ST for at least 12 months and were non-smokers, were included. Lipid profiles, including total cholesterol, triglycerides, high-density lipoprotein cholesterol (HDL-C), and low-density lipoprotein cholesterol (LDL-C), were measured after an overnight fast. Patients on lipid-altering medications or with significant comorbidities were excluded. Statistical analysis was performed using SPSS version 22.0.

Results: The cohort predominantly consisted of young men (87%), with a mean age of 21.72 ± 3.66 years. Most participants were students (57%) and from low socioeconomic backgrounds (89%). Overall, lipid levels were generally within normal ranges, with the exception of low levels of HDL-C, which were particularly pronounced in women. In detail, the mean HDL-C for men was 41.55 ± 6.94 mg/dL, whereas women exhibited significantly lower HDL-C levels at 30.09 ± 5.94 mg/dL ($p < 0.01$). Other lipid parameters, including LDL-C, total cholesterol, and triglycerides, did not show significant elevations. Specifically, the mean LDL-C was 147.16 ± 3.60 mg/dL for men and 136.36 ± 9.96 mg/dL for women ($p < 0.01$), while total cholesterol levels averaged 125.70 ± 23.81 mg/dL for men and 124.55 ± 27.52 mg/dL for women ($p = 0.882$). Triglycerides were comparable between genders, with men at 131.21 ± 17.14 mg/dL and women at 131.91 ± 20.70 mg/dL ($p = 0.902$).

Conclusion: This study found that while overall lipid levels were normal, female participants exhibited significantly low levels of HDL-C, indicating potential gender-specific cardiovascular risks.

Keywords

Smokeless Tobacco, Lipid Profile, Young Adults, Cardiovascular Risk, Dyslipidemia.



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Introduction

Smokeless tobacco (ST) consumption is widespread across South Asia, particularly in countries such as Bangladesh, Pakistan, and India, where it is used both recreationally and habitually. The prevalence of ST use is rising, especially among young adults, reflecting a troubling trend with significant public health implications^{1,2}. The habitual use of ST imposes a substantial economic burden on these nations, and its long-term health impacts, including various chronic diseases, are well-documented. Despite numerous policies and interventions aimed at curbing its use, efforts have yielded only partial success, leaving ST as a persistent clinical and cultural challenge in the region^{3,4}.

There is strong evidence linking ST to cardiovascular diseases (CVDs) and adverse health outcomes. While the increased risk associated with ST use is not as high as that of smoking, it is still significantly greater than for non-users⁵⁻⁹. The effect of ST on lipid levels appears to parallel that of smoking, with studies consistently demonstrating abnormal lipid profiles among users across different age groups and genders¹⁰⁻¹². However, the data remains inconclusive in establishing a definitive correlation between ST consumption and dyslipidemia severe enough to trigger negative cardiovascular outcomes.

The detrimental impact of ST on cardiovascular health is well-recognized, but the debate persists around the extent of harm it causes. The conversation is not about whether ST is harmful but rather about the degree to which it contributes to adverse cardiovascular outcomes. Despite the widespread use of ST and its recognition as a public health issue, there is a surprising paucity of local data exploring its effects on cardiovascular health. This is particularly concerning given the scale of ST consumption in the region, suggesting an urgent need for research that addresses this knowledge gap.

The objective of this study is to assess the impact of smokeless tobacco use on lipid profiles in young adults from an urban center in Pakistan. By

analyzing lipid parameters in this cohort, the study aims to provide insights into the potential cardiovascular risks associated with ST use among young populations, thereby contributing valuable data to the limited body of research on this topic in Pakistan.

Methodology

Study Design

This study was a prospective observational analysis conducted over a six-month period, from November 2021 to April 2022, at the Sindh Government Hospital Liaquatabad. The study aimed to evaluate the lipid profiles of individuals who used ST and assess the potential impact on lipid levels. The sampling technique utilized was consecutive non-probability sampling, where participants meeting the inclusion criteria were recruited sequentially.

Ethics

Ethical approval for the study was obtained from the hospital's Institutional Review Board (IRB). All participants provided written informed consent before inclusion in the study. Patient confidentiality was strictly maintained throughout the research process, ensuring that no personal identifying information was disclosed. The study complied with the principles outlined in the Declaration of Helsinki.

Setting

The study took place at Sindh Government Hospital Liaquatabad, a tertiary care hospital in Karachi, Pakistan, which provides healthcare services to a diverse population, including those from low socio-economic backgrounds. Laboratory assessments were conducted using either philanthropic support or social healthcare services available at the hospital.

Participants

The study included individuals aged 18 to 29 years who, by self-admission, had been using some form of ST for at least 12 months. Participants were non-smokers, defined as having no history of using any smoked tobacco products. Patients who were using lipid-altering medications at the time of the

first lipid profile measurement, such as statins, ezetimibe, fibrates, bile acid sequestrants, niacin, or combinations thereof, were excluded. Additionally, individuals using multivitamins or off-label supplements were not considered for the study. Those with chronic liver disease (viral or alcoholic), renal pathology, significant cardiovascular conditions, malignancy, active sepsis, or parasitic infections were also excluded.

Variables

The primary variables assessed in this study included age, gender, occupation, marital status, and lipid profile parameters. The lipid profile consisted of total cholesterol (TC), triglycerides (TGL), high-density lipoprotein cholesterol (HDL-C), and low-density lipoprotein cholesterol (LDL-C).

Data Sources/Measurement

Data collection was performed during routine clinical visits. The fasting lipid profile was obtained after a minimum of 12 hours of fasting. Blood samples were drawn for the determination of serum TC, TGL, HDL-C, and LDL-C. Laboratory tests were conducted in the hospital's biochemistry laboratory, using standardized methods for lipid analysis. Quality control procedures were adhered to during sample handling and analysis to ensure accuracy. Participant demographics, medical history, and ST use details were recorded via structured interviews.

Bias

Efforts were made to minimize selection bias by employing consecutive non-probability sampling. Information bias was reduced by using a standardized interview process and laboratory protocols for lipid measurements. However, the observational nature of the study limited the ability to control for all potential confounding factors.

Study Size

The sample size was determined based on the availability of participants who met the inclusion criteria during the study period. Recruitment continued until a sufficient number of eligible participants were enrolled to achieve reliable statistical analysis of lipid profiles among ST users.

Quantitative Variables

Quantitative variables included age (continuous), total cholesterol (mg/dL), triglycerides (mg/dL), HDL-C (mg/dL), and LDL-C (mg/dL). These were analyzed as continuous variables, with means and standard deviations calculated for each.

Statistical Methods

Data analysis was performed using the Statistical Package for the Social Sciences (SPSS) version 22.0 (IBM Corp., Armonk, NY). Continuous variables, such as age and lipid levels (TC, TGL, HDL-C, and LDL-C), were summarized using means and standard deviations. Categorical variables, including gender, age groups, occupation, and marital status, were described using frequencies and percentages. Independent samples t-test was used to assess the association between lipid profile parameters and gender, with a p-value of less than 0.05 considered statistically significant.

Results

Participants

A total of 100 individuals participated in the study, all of whom were smokeless tobacco (ST) users aged 18-29 years. The average age of participants was 21.72 ± 3.66 years. The cohort predominantly consisted of males (87%), while females made up 13% of the sample. Most participants were students (57%), with other occupations including labor workers (16%), professional drivers (15%), unemployed individuals (9%), housewives (2%), and one participant from a different occupation (1%). The socio-economic background of the majority (89%) was classified as low socio-economic status, while the remaining 11% were from middle-to-low socio-economic backgrounds.

Descriptive Data

The demographic details and occupational distribution of the participants are provided in Table 1. Males formed the overwhelming majority, with a substantial proportion of participants being young students and mostly unmarried. The socio-economic status was predominantly low, reflecting the study setting's patient population.

Table 1: Demographics of study participants (N = 100).

Variable	N(%)	
Age (years); Mean±SD	21.72±3.66	
Gender	Male	87(87.0)
	Female	13(13.0)
Occupation	Student	57(57.0)
	Labor	16(16.0)
	Professional Driver	15(15.0)
	Unemployed	9(9.0)
	Housewife	2(2.0)
	Other	1(1.0)
Socio-Economic Status	Low	89(89.0)
	Middle-to-low	11(11.0)

Outcome Data

Lipid profile parameters were evaluated for all participants, revealing significant differences between males and females in the levels of total cholesterol, triglycerides, HDL-C, and LDL-C. Notably, HDL-C levels were found to be pathologically low across both genders, with females exhibiting more pronounced reductions.

Main Results

The study indicated that smokeless tobacco users had significantly lower levels of HDL-C, particularly among women. Specifically, women had an average HDL-C level of 30.09 ± 5.94 mg/dL, significantly lower than men, who had an average of 41.55 ± 6.94 mg/dL ($p < 0.01$). Additionally, total cholesterol levels were comparable between genders, with men showing an average of 125.70 ± 23.81 mg/dL and women at 124.55 ± 27.52 mg/dL ($p = 0.882$), while triglyceride levels were also similar, with men at 131.21 ± 17.14 mg/dL and women at 131.91 ± 20.70 mg/dL ($p = 0.902$). LDL-C levels were significantly higher in men (147.16 ± 3.60 mg/dL) compared to women (136.36 ± 9.96 mg/dL) ($p < 0.01$).

Table 2: Lipid profile parameters of participants (N = 100).

Lipid Parameter	Men	Women	P-value
Total Cholesterol (mg/dL)	125.70±23.81	124.55±27.52	0.882
Triglycerides (mg/dL)	131.21±17.14	131.91±20.70	0.902
High-Density Lipoprotein-C (mg/dL)	41.55±6.94	30.09±5.94	<0.01*
Low-Density Lipoprotein-C (mg/dL)	147.16±3.60	136.36±9.96	<0.01*

* $p < 0.05$ is considered statistically significant.

Discussion

The use of smokeless tobacco (ST) among young adults is increasingly prevalent in regions where it is endemic, such as Bangladesh, Pakistan, and India. Our study echoes the findings from other regions, with a high prevalence of ST use among young men¹¹⁻¹⁴. This aligns with the International Tobacco Control Survey (ITC), which documented

significantly higher ST use among males compared to females across 28 countries¹⁴. In our cohort, a large proportion of participants were students at high school or college levels, suggesting a trend of early initiation. Alarming, many participants reported starting ST use in their teenage years, with a substantial portion using it for nearly a decade. This early and sustained use raises concerns about the long-term health risks and the lack of

awareness regarding quitting strategies, as none of the participants had attempted or contemplated cessation.

The role of education in reducing ST use remains complex and somewhat inconclusive. While some studies have reported an inverse relationship between higher education levels and ST consumption¹⁵, our findings did not show a significant difference in usage patterns between students and non-students. Over half of the participants were enrolled in college or university, indicating that even higher education may not act as a strong deterrent against ST use. This highlights the need for more targeted research to understand the influence of education on ST behaviors and to develop more effective prevention strategies.

Our study also reaffirms certain established determinants of ST use, such as male gender, low socioeconomic status, and urban residence. These findings are consistent with previous literature indicating that individuals from lower socioeconomic backgrounds, especially in urban settings, are more likely to consume ST¹⁶. The high prevalence of ST use among individuals from low socioeconomic strata may be linked to factors such as stress, accessibility, and cultural acceptance of oral tobacco products. These socio-demographic factors present critical points for public health interventions aimed at reducing ST consumption.

Regarding the health impact of ST use, previous studies have linked it to increased cardiovascular risk due to its effects on oxidative stress markers and lipid profiles. ST consumption has been shown to reduce the activity of antioxidant enzymes like glutathione peroxidase (GPx) and superoxide dismutase (SOD), decrease HDL-C levels, and increase the ratio of cholesterol, LDL, and triglycerides¹⁷. Additionally, ST use is associated with decreased adiponectin levels, which could impair glycemic control and lipid metabolism¹⁸. Furthermore, it may reduce the efficacy of cardiovascular medications, compounding the risk for adverse cardiac events¹⁹.

However, the evidence regarding the association between ST use and dyslipidemia remains inconsistent^{10-12,20}. Some studies report abnormal lipid levels among ST users, while others indicate normal or even reduced levels^{19,21,22}. Our results align more closely with the latter, showing that lipid parameters, except for HDL-C in women, were within normal ranges²³⁻²⁶. Although HDL-C levels were pathologically low in women, this finding may be more reflective of regional epidemiological trends rather than a direct consequence of ST use, as reduced HDL-C levels are common among women in South Asia, regardless of tobacco use. Therefore, the observed patterns in our study may be influenced by baseline population characteristics rather than the effects of ST alone.

Despite the inconclusive evidence regarding the impact of ST on lipid levels, our findings suggest that ST use does not significantly impair lipid metabolism in young adults. This conclusion, however, does not negate the potential cardiovascular risks associated with ST use, as lipid profile changes represent only one aspect of cardiovascular risk assessment. Future research should aim to explore additional metabolic and biochemical factors to provide a more comprehensive risk profile for ST users.

Limitations

This study on lipid profile alterations in young adults using smokeless tobacco (ST) has several limitations. Firstly, the small sample size may not provide a comprehensive representation of the broader population, potentially limiting the generalizability of the findings. Additionally, the reliance on self-reported ST use may introduce recall bias, as participants may underreport or misreport their consumption. Furthermore, the study was conducted in a single urban center, limiting its diversity and applicability to other regions with varying socio-economic and cultural contexts.

Conclusion

This study highlights the high prevalence of ST use among young adults in Pakistan, particularly

among males and individuals from low socioeconomic backgrounds. While lipid parameters, other than HDL-C in women, were within normal ranges, the findings suggest a potential need for region-specific cardiovascular risk assessments that consider socio-demographic factors and ST usage patterns. The results underscore the importance of targeted public health efforts to address the growing trend of ST use and its associated health risks in young populations. Further research with comprehensive metabolic and biochemical profiling is warranted to clarify the relationship between ST use and cardiovascular health.

Conflicts of Interest

The author(s) declare no conflicts of interest.

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