

Effect of smokeless tobacco on plasma lipoproteins in adolescents

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Abstract

The effect of smokeless tobacco on specific plasma lipoprotein fractions was studied in adolescents. Results indicated that users (N = 36) had significantly higher levels of total cholesterol (TC) and low-density lipoproteins (LDL) than nonusers (N = 21). There was no significant difference in the high-density lipoprotein (HDL) fraction. Also, the LDL/HDL ratio was significantly higher in user groups than nonusers.

Current evidence indicates that there is an increased risk of cardiovascular heart disease (CHD) in those who smoke compared to those who do not.¹

Although a relationship between smoking and CHD has been established, the identification and significance of relevant factors that may impact on this relationship have not been completely elucidated. Factors which are being recognized as having an important role in the interaction of smoking and subsequent CHD are the concentrations of specific fractions of plasma lipoproteins. For example, follow-up data from a 12-year study showed that the CHD risk increases with increasing levels of blood pressure or serum cholesterol and at each level of these two risk factors, the risk in smokers is greater than in nonsmokers (Castelli 1984).

A previous report indicates that smoking has a specific effect on lipoprotein plasma levels (Pozner and Billimoria 1970). Epidemiologic studies have demonstrated an inverse relationship between HDL plasma levels and the incidence of CHD (Criqui et al. 1980). In other words, those groups of individuals known to be at a lower risk for CHD have been observed to have relatively high levels of HDL. The importance of these observations is that most of the cholesterol in the plasma is complexed in the LDL fraction, which appears to have atherogenic properties. A lesser proportion of chole-

sterol is complexed with HDL which appears to have antiatherogenic properties.²

The HDL levels in the cigarette smoker have been found to be significantly lower than in nonsmokers (Gnasso et al. 1984). There is a large body of literature describing the effect of smoked tobacco on plasma lipoproteins. However, there are no similar studies on the effect of smokeless tobacco on plasma lipoproteins, despite its dramatic increase in use.

Therefore, the purpose of this study was to determine the effect of the use of smokeless tobacco on the plasma lipid profile, namely TC, triglyceride (TG), LDL, HDL, and very low-density lipoprotein (VLDL) in young healthy adolescent males.

Subjects and Methods

A total of 57 healthy males in high school grades 9-12 (14-18 years) voluntarily participated in this study. The subjects were divided into two groups of 36 users and 21 nonusers as determined by their responses to a confidential questionnaire on the use of smokeless tobacco. The test group constituted those who currently use smokeless tobacco on a regular basis. The controls were an age-matched group who did not nor ever used any tobacco products.

Each subject was given a private interview with the investigators. In the interview, the questionnaire and health history forms were reviewed. The subjects then were assigned to the appropriate group (user versus nonuser). Blood sampling occurred at a later session. For the blood sampling session, the subjects were requested to refrain from eating or using any tobacco products following the evening meal on the day prior to sampling, thereby constituting a fasting period of approximately 14-16 hr. A 10-ml sample of venous blood

¹Garrison et al. 1978; VanGent et al. 1978; Hulley et al. 1979; Kannel 1981.

²Spain and Nathan 1961; Billimoria et al. 1975; Topping et al. 1977; Dedonder-Decoopman et al. 1980.

was collected by a trained and licensed phlebotomist from the median cubitus vein of the left arm while the subject was in the sitting position. All the samples were analyzed at Roche Biomedical Laboratories, Columbus, Ohio, for plasma lipid profile, according to the method of Leon and Staswi (1976). The data were analyzed with independent *t*-tests to determine any significant differences between the two groups on the indicated blood lipid values.

Results

The results of the lipid analysis are presented in the Table. The user and nonuser groups were significantly different in terms of their plasma concentration levels of TC ($t = 3.36$; $P < .001$), LDL ($t = 2.87$; $P < .006$), and LDL/HDL ratio ($t = 2.44$; $P < .018$); however, they did not differ statistically on any other variables analyzed.

TABLE 1. Comparisons of Plasma Constituents in Users and Nonusers

Plasma Constituents (mg/dl)	Nonuser		User		P
TC	157.9 ± 5.61*		197.9 ± 10.12		0.0002
LDL	95.7	5.43	123.6	5.43	0.0002
VLDL	11.8	1.53	17.4	3.67	0.167
HDL	49.4	1.99	47.0	3.30	0.530
TG	59.9	8.37	96.1	8.38	0.087
LDL/HDL	1.98 ± 0.49		2.88 ± 1.29		0.009

* Mean ± SD.

Discussion

This study evaluated the effect of the use of smokeless tobacco on plasma lipoproteins in young, healthy male adolescents who were between the ages of 14 and 18 years. The results clearly indicated that the user of smokeless tobacco had significantly higher TC levels and LDL in their plasma than the nonusers. The TG, VLDL, and HDL, although elevated in the users, were not significantly different from the nonusers. Differences in the ratio of LDL/HDL between the two groups was statistically significant. These are interesting findings in that this ratio may be the most important predictive factor for the development of coronary heart disease (Miller and Miller 1975). The relationship of LDL/HDL ratio is important in terms of the purposed role of HDL in reverse transporting of cholesterol from tissue and possibly the arterial walls back to the liver for catabolism. As a result, the HDL is acting as a scavenger of cholesterol (Carew et al. 1976). Another purposed mechanism is the inhibition of cellular uptake of LDL by HDL (Stein and Stein 1976; Miller et al. 1977).

In general, the findings of this study are in agreement with those of others who studied smoking tobacco.³ The implications of these findings continue to be alarming in

³Boyle et al. 1968; Bizzi et al. 1972; VanHoute and Kesteloot 1972; Berg et al. 1979; Hojnacki et al. 1981; Rabkin et al. 1981; Voors et al. 1982.

that although the prevalence of smoking is decreasing, that of smokeless tobacco is increasing. Therefore, the potential impact on the general health of the users of smokeless tobacco and their effectiveness in the work force as well as the economy of the United States remain significant matters of concern.

These findings tend to support those of Seidel et al. (1984). They demonstrated that of all the lipoprotein plasma parameters, HDL is the most strongly influenced by factors such as lifestyle, alcohol intake, body weight, and physical activity. Specifically, they found that smoking does not lower HDL in subjects with ideal body weight.

It is apparent from the preliminary data that smokeless tobacco affects plasma lipoproteins in a fashion similar to that of smoking tobacco. However, well controlled and detailed studies are required to define further the association between HDL-cholesterol, its fractions, and other lipoproteins in smokeless tobacco users. Since the population of smokeless tobacco users is, in general, younger than smoking tobacco users, it is imperative that more research be addressed toward the potentially detrimental effect of smokeless tobacco on the cardiovascular system.

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On which side do you chew?

In a study to examine the effects of occlusion on chewing side preference in dental students, researchers concluded that: (1) initial and subsequent chewing side preferences were strongly correlated; (2) crossbites, bridge work, posterior teeth that do not contact in centric occlusion, working or balancing interferences, open contacts, tooth mobility, fremitus, sensitivity to air, or percussion do not correlate with chewing side preference; and (3) signs of mandibular dysfunction — TM disorder sounds, difficulty in opening or chewing, restricted range of movement, opening or closing deviations, muscle pain, and TM disorder pain — also did not correlate with chewing side preference.