



## A Comparative Study of Atherogenic Indices in Cases of Smoked Nicotine and Chewed Nicotine Users

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### Abstract

**Objective:** To study the atherogenic indices exposed to tobacco chewing and compare these findings with that of smokers and control subjects.

**Methods:** This study was conducted at Jawaharlal Nehru Medical College, Aligarh. 180 subjects were included in this study. The subjects were divided in three groups. Group I (Tobacco chewers-chewed nicotine), Group II (Smokers-smoked nicotine) and Group III (control subjects). Each group consists of 60 subjects. Various anthropometric lipid profiles parameters and atherogenic indices were recorded and compared among these three groups.

**Results:** Significant difference was found for weight and body mass index ( $p < 0.001$ ) between smokers and control subjects. When compared to control subjects, tobacco chewers had significantly higher total cholesterol/HDL-C ( $p < 0.001$ ), LDL-C/HDL-C ( $p < 0.001$ ) and Non HDL-C/HDL-C ( $p < 0.001$ ) were found in chewers as compared to controls, but significant higher atherogenic indices values were also found in ( $p < 0.05$ ) in smokers as compared to control.

**Conclusion:** The present study shows that both tobacco chewing and smoking has adverse effect on atherogenic indices and tobacco users have significantly higher adverse effect atherogenic indices than tobacco non-users.

**Keywords:** tobacco, chewing, smoking, atherogenic indices

### Introduction

In the present scenario of the world, the consumption of nicotine is the single biggest avoidable cause of death and disability. Consumption of nicotine is now increasing rapidly throughout the developing world and is one of the biggest threats to current and future world health. For nicotine consumer, quitting is the single most important thing they can do to improve their health. Encouraging quitting is one of the most effective and cost effective thing that doctors and other health professionals can do to improve health and longevity of patient's lives.

Tobacco can be ingested in two main ways: by chewing or smoking. Chewing is used, either by placing a plug of tobacco in the gingival buccal-mucosa or by chewing it. Smokers are found worldwide while tobacco chewers are restricted to certain geographic areas like India and central Asia. Tobacco use as smoking and chewing is highly prevalent in youth and adult of both males and females in India. Tobacco is consumed in the form of pan, gutka, khaini, pan-masala, mawa, etc. According to the American Heart Association (AHA), nicotine is a highly addictive drug. Nicotine causes changes in

brain chemistry that are both physically and psychologically addictive. The AHA reports that 160,000 deaths each year are due to cardiovascular disease caused by smoking cigarettes. Heart disease is also caused by chewing tobacco, because nicotine itself in tobacco products has negative effects on the body's cardiovascular system. Nicotine causes short-term increases in blood pressure, heart rate, and blood flow through the heart, which can contribute to heart disease. Carbon monoxide in cigarette smoke causes artery damage, resulting in fatty buildup in the arteries, which leads to increased blood pressure and ultimately to cardiovascular disease<sup>1</sup>.

According to Centers for Disease Control and Prevention (CDC), the use of tobacco is number one preventable cause of illness and death in the United States. Cigarettes, smokeless tobacco, cigars, pipes and second-hand smoke cause 480,000 deaths per year. The American Cancer Society (ACS) reports tobacco use kills more people than automobile accidents, suicide, AIDS, murder, and alcohol and illegal drugs combined. Tobacco use has multiple effects on the body and nearly every organ in the body is harmed by tobacco use. A smoker's life is shortened by an average of 14 years, and smokeless tobacco users also face life-shortening risks<sup>2</sup>.

Coronary heart disease (CHD), which accounted for more than seven million deaths in 2004 is the leading cause of mortality worldwide. Among the risk factors of CHD, tobacco uses in the second most important cause following hypertension<sup>3,4</sup>.

According to World Health Report<sup>5</sup>, tobacco is the most important preventable cause of overall mortality as well as cardiovascular mortality worldwide. Cigarette smoking is a major risk factor for coronary heart disease, Ischemic stroke, Cancers and pulmonary tuberculosis.

AI (Atherogenic Index) is strong indicator to predict the risk of atherosclerosis and coronary heart disease. It reflects the true relationship between protective and atherogenic lipoprotein and is associated with the size of pro and anti atherogenic lipoprotein particle. Proatherogenic non-HDL-c determined as a valid surrogate to apolipoprotein B 100 (Apo-B) in the assessment of atherogenic cholesterol and lipoprotein burden<sup>6</sup>. It is established that the measurement of non-HDL-c is a better predictor of CVD than LDL-c<sup>6</sup>.

Nicotine is an important substance present in tobacco and has toxic effects on cardiovascular system. Nicotine stimulates the secretion of adrenaline which leads to lipolysis Tobacco is well known to increase risk of oral and gastrointestinal cancers but whether it increases the adverse effect on atherogenic indices tobacco chewers has not been studied well. So, present work is an attempt to study the atherogenic indices exposed to tobacco- chewing and compare these findings with that of smokers and control subjects.

## MATERIAL AND METHOD

The present study was done in the Department of Physiology in collaboration with department of Tuberculosis (TB) & Respiratory disease of J. N. Medical College, A.M.U, Aligarh. Total 180 subjects were taken for this study and they were classified into 3 groups, Tobacco-chewers (chewed nicotine), Smokers (smoked nicotine) and Control. Each group consists of 60 subjects. The Anthropometric Measurements and lipid profiles Parameters were measured for all the subjects.

**Selection of Subjects:** After approval from the ethical committee, valid consent was taken from all subjects. Both sexes were taken and the age of the subjects varied from 20 - 65 years with mean age of the subjects was 47.55 years.

**Exclusion Criteria:** Subjects with history of alcohol intake, known cases of any medical illness (Diabetes, hypertension, renal diseases, respiratory ailments etc.) were excluded from the study. Subjects having both habits (smoking and chewing) simultaneously were also excluded.

**Inclusion Criteria:** Subjects having age group in between 20 to 65 years were included having either habit of smoking or chewing for more than 5 years.

All the subjects were evaluated with detailed history, complete general and cardiovascular examinations. Estimation of cholesterol was done by one step method of Wybenga and Pillegi. Estimation was done by this formula Friedwalds equation.

Serum/plasma cholesterol (mg/dl) = OD of test x200/OD of STD.

HDL cholesterol was estimated by this method

Serum HDL cholesterol (mg/100ml) = OD Test x50/OD STD.

Estimation of triglycerides by GPO PAP method

$$TG = \frac{(\text{Absorbance of test} - \text{Absorbance of blank})}{(\text{Absorbance of STD.} - \text{Absorbance of blank})}$$

Statistical evaluation was done by Mean, Standard deviation and t-test. Numerical datas were reported as mean± SD. Unpaired t-test was used to compare two groups. P values less than 0.05 was considered significant.

**Results**

Table 1 shows anthropometric and cardiovascular parameters in three groups (chewers, smokers and control), while comparison among these groups are depicted in Table 2.

The mean age for tobacco chewers (Group A), smokers (Group B) and control (Group C) were 47 ±11.97, 48.85 ±14.42 and 46.08 ± 9.38 years respectively and statistical difference was found to be non-significant. Significant difference for weight was

seen between smokers and control subjects (p<0.001) but there was no significant difference for weight seen between tobacco chewers and control subjects. No significant difference was found for height among three groups. The mean body mass index (BMI) was significantly lower in smokers as compared to control (p<0.001) but no significant difference was found between tobacco chewers and control as well as between tobacco chewers and smokers.

TC/HDL-C was significantly increased in both tobacco chewers (p<.001) and smokers (p=.022).

LDL-C/HDL-C was significantly increased in both chewers (p<.001) and smokers (p=0.017).

Non HDL-C/HDL-C was significantly increased in both chewers (p<.001) and smokers (p=0.019). Although the mean values of other given indices of chewers were greater than smokers but were not statistically significantly.

**TABLE I Anthropometric Measurements and Atherogenic Indices**

S. No.	Parameters	Chewers(A)	Smokers(B)	Control(C)
1	Age	47±11.97	48.85±14.42	46.08±9.38
2	Wt.	61.35±16.4	52.45±8.17	65.75±4.47
3	Ht.	167.55±6.81	170.85±4.65	169.1±5.17
4	BMI	21.65±4.74	17.96±2.7	23.03±1.73
5	T.C/HDL-C	5.22±2.09	4.80±2.74	3.24±0.66
6	LDL-C/HDL-C	3.57±1.91	3.38±2.60	1.82±0.61
7	Non-HDL/HDL-C	4.32±2.04	3.85±2.72	2.25±0.65

**TABLE II (Significance of Anthropometric and Atherogenic Indices)**

S. No.	Parameters	A vs C	B vs C	A vs B
1	Age	0.646	0.389	0.697
2	Wt.	0.282	<0.001*	0.083
3	Ht.	0.616	0.836	0.766

A - Chewers

4	BMI	0.178	<0.001*	0.06	B - Smokers
6	T.C/HDL-C	<0.001*	0.022*	0.588	C - Control
7	LDL-C/HDL-C	<0.001*	0.017*	0.789	
8	Non-HDL/HDL-C	<0.001*	0.019*	0.54	

## Discussion

Because of vigorous efforts toward increase awareness of adverse effects of tobacco, smoking has declined consistently over the last 30 years but the use of smokeless tobacco and snuff has greatly increased since then<sup>7</sup>. Nicotine is the major addicting substance in the tobacco and is thought to be responsible for majority of the adverse effects associated with its use. Tobacco chewing is used either by placing plug of tobacco in the gingival buccal mucosa or by chewing it<sup>7</sup>. In our country tobacco is consumed in the form of pan, gutka, khaini, pan masala etc. Both smoking and tobacco chewing act as a medium to transport nicotine to the body. The maximum level of nicotine obtained by single exposure of smoking or smokeless tobacco was found to be almost similar. Smoking produces rapid peaks and troughs, while smokeless tobacco use causes more prolonged and sustained level of nicotine<sup>8</sup>. Cigarette smoking is well known to increase the risk for cardiovascular disease. It accelerates atherosclerosis, increases myocardial workload, reduces the oxygen carrying capacity of blood, causes coronary vasoconstriction, increases catecholamine release and induces a hypercoagulable state leading to an increased risk for myocardial infarction. Accelerated atherosclerosis due to cigarette smoking is mediated by an adverse effect on lipid profiles, endothelial dysfunction, oxidant injury, neutrophil activation, increased thrombosis and increased fibrinogen level<sup>7</sup>. Lipid peroxide compounds enhance the synthesis of prostaglandins which further produces free radicals. Finally all the pathway increase the production nitric oxide which is well known risk factor for atherosclerosis.

Chewing tobacco could result in significantly greater deleterious cardiovascular effects due to a larger overall exposure owing to prolonged absorption<sup>9, 10</sup>.

In this study we observed that weight and BMI was significantly lower in smokers as compared to control

subjects but weight and BMI of chewers were not significantly decreased as compared to control subjects. Similar findings were also obtained by other authors<sup>11, 12</sup>. This could be due to the fact that Chewing tobacco does not interfere with eating habits as much as smoking.

Atherogenic indices were significantly raised in both chewers and smokers and similar results were also reported by other authors<sup>11-23</sup>. These changes could cause sympathetic neural stimulation and adverse effects on atherogenic indices. Catecholamine causes increase lipolysis which also results in adverse effect over lipid profile and atherogenic indices. Prostaglandins enhance atherosclerosis by nitric oxide production<sup>24</sup>.

## Conclusion

Since ages it is believed that smoking has deleterious effects over health. Many studies done in past have also tried to emphasized this point but due to less study and as well as less publicity of harmful effects of chewing tobacco, people are thinking tobacco chewing is an alternative of smoking with less harmful effects but the present study showed that chewing tobacco is associated with similar adverse effects on Atherogenic indices as that of smoking, but in some extent chewing is more harmful than smoking due to prolonged systemic absorption. So it is a need of time that advertisement of deleterious effects of both smoking and tobacco chewing is equally important. We should prevent the tobacco chewing by proper education, well planned counseling and appropriate legislation.

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