

A Study of Blood Pressure and Electrocardiography Changes among Smokeless tobacco and Non Smokeless Tobacco Chewer Persons

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ABSTRACT

Introduction: Tobacco chewing is one of the common causes of the preventable deaths globally. It contains nicotine which causes physical and psychological dependencies increases the blood coagulability and causes conduction block, re-entry and ventricular fibrillation. SLT components causing cardiovascular abnormalities assessed by doing cheapest method ECG.

Materials and Methods: A prospective case control study was done on 100 Smokeless tobacco and 100 non chewers. Detailed clinical examination was done to rule out any other physical illness. BP and 12 lead ECG were done in all participants. Systolic blood pressure, diastolic blood pressure, Resting heart rate, the p wave, the PR interval, the QRS complex, QTc (corrected QT interval), ST segment, T wave abnormalities were assessed in both group and statistical analysis was done by unpaired T test.

Results: Prevalence of hypertension was higher in smokeless tobacco chewers. A significant correlation with elevated systolic blood pressure, diastolic blood pressure and mean arterial blood pressure was noted. ($p \leq 0.01$) The heart rate was increased in Smokeless tobacco users which was statistically significant. The RR interval, The analysis showed that QTc interval was shortened and that the QRS complex duration was widened the QT interval and the ST segment were shortened as compared to those in the non-smokeless tobacco users which was highly significant statistically.

QTc interval was shortened and that the QRS complex duration was widened in the Smokeless tobacco users, although the values did not show any statistical significance.

Conclusion: ECG is an important tool in predicting cardiovascular morbidity in Smokeless tobacco chewers. Not only the ST-T changes or chamber hypertrophy but also resting heart rate, PR interval and QT interval should be measured in Smokeless tobacco users periodically to predict cardiovascular involvement early.

Keywords: Blood Pressure, Electrocardiography, Smokeless Tobacco.

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INTRODUCTION

Tobacco chewing is important and independent risk factor for coronary heart disease. Men younger than 65 years with chewing 25 SLTs per day had increased risk of coronary artery disease than that of non-slt user. Effects of chewing on cardiovascular system are varied.¹

The frequency and duration of chewing plays an important role in determining the extent of harm caused to cardiovascular system.² Binding of nicotine to nicotine cholinergic gate on cation channel receptor throughout body especially heart, pancreas, spleen, caecum, testis and eyes.³ It is facilitated by increase oxidative stress by direct effect of nicotine on conduction and re-entry

pathway and also increase vulnerability to ventricular arrhythmias. An Electrocardiogram is a graphic recording of electric potentials generated by the heart. Recording of ECG is one of the easiest, cheap and reliable methods of assessing cardiovascular function. Various

Studies have shown that chewing habit induces changes in the normal ECG pattern like increase in heart rate short PR interval, QTc interval shortening but the results have been inconsistent. This study was conducted with aim to observe changes in blood pressure, resting heart rate various ECG parameters amongst Smokeless tobacco and non-Smokeless tobacco users.

MATERIALS AND METHODS

This was a prospective case control study conducted at department of cardiology, S. P. Medical College, Bikaner. Cases were apparently healthy male Smokeless tobacco users between age ≥ 18 years, selected from among students and staff of the institute, and attendants of patients visiting outpatient departments at the hospital. Age and Sex matched controls (non-Smokeless tobacco users) were also considered for study. The research procedure followed was in accordance with the approved ethical standards and study was approved by Institutional Ethics Committee (Human).

A written consent was taken from all potentially eligible subjects. Detailed history was taken and physical examination was performed and recorded on predesigned proforma from each patient and informed consent was obtained from those willing to participate in the study.

The chewing history and their past medical history were also obtained in case if they are suffering from chronic diseases Smokeless tobacco were divided into the following categories4 Mild Smokeless tobacco users (1-10 SLTs or 1-15 tobacco products per day), Moderate Smokeless tobacco (11-20 SLTs or 16-30 tobacco products per day), Heavy Smokeless tobacco (21 or more SLTs or 31 tobacco products per day). Blood pressure

(BP) measurements were taken from each patient's right arm in the seated position by using mercury sphygmomanometer and recording resting radial pulse rate. The final study group consisted of 100 Smokeless tobacco and 100 non-Smokeless tobacco users.

Subjects were asked to abstain from chewing and caffeine beverages, 2 hours prior to the taking of the ECG recording and blood pressure measurement. A 12 lead electrocardiogram was recorded in each subject in lying down. The ECGs were evaluated for any cardiac abnormality in terms of rate, frontal axis deviation, conduction defect, arrhythmia, chamber hypertrophy or any change suggestive of ischemia With special emphasis on the resting Heart rate, P wave, PR interval, QRS duration, QTC interval, ST segment, T wave, TP interval and frontal axis.

Statistical Analysis

Data was analyzed using Statistical Package for Social Sciences, version 20 (SPSS Inc., Chicago, IL). Results for continuous variables are presented as mean \pm standard deviation, whereas results for categorical variables are presented as number (percentage). Student t-test was used for comparison between slt and non-Smokeless tobacco groups. The level $P < 0.05$ was considered as the cutoff value or significance.

Table 1: Demographic profile age wise and sex wise distribution in both groups

Age group (years)	SLT user* (N=100)	Non-SLT user* (N=100)	P value
≤ 30 year	15 (15.0%)	37 (37.0%)	<0.001
31 to 40 year	16 (16.0%)	23 (23.0%)	
41 to 50 year	20 (20.0%)	20 (20.0%)	
51 to 60 year	29 (29.0%)	14 (14.0%)	
>60 year	20 (20.0%)	6 (6.0%)	
Mean Age(Mean \pm SD)	49.14 \pm 14.12	37.93 \pm 13.23	<0.001
Gender	Male	74 (74.0%)	0.0170
	Female	26 (26.0%)	

*= frequency (%)

Table 2: Comparison of ECG parameters between Smokeless tobacco and non-Smokeless tobacco

	SLT user (Mean \pm SD) (N=100)	Non-SLT user (Mean \pm SD) (N=100)	P value
P wave voltage	1.53 \pm 0.51	1.35 \pm 0.70	0.040
P wave duration (seconds)	0.082 \pm 0.03	0.081 \pm 0.03	0.846
PR interval (seconds)	0.16 \pm 0.04	0.18 \pm 0.04	<0.001
QRS duration (seconds)	0.040 \pm 0.0	0.044 \pm 0.02	0.059
QT interval (milliseconds)	361.2 \pm 25.4	376.8 \pm 51.27	0.007

Table 3: ST segment changes in Smokeless tobacco and non-Smokeless tobacco

ST segment	SLT user (Number of patients (%)) (N=100)	Non-SLT user (Number of patients (%)) (N=100)
No elevation or depression	77 (77.0%)	100 (100.0%)
Elevation or depression	23 (23.0%)	0 (0.0%)

Table 4: T wave morphology in slt and non-slt user group

T wave morphology	SLT user (Number of patients (%)) (N=100)	Non-SLT user (Number of patients (%)) (N=100)
Normal	78 (78.0%)	100
Abnormal	22 (22.0%)	0

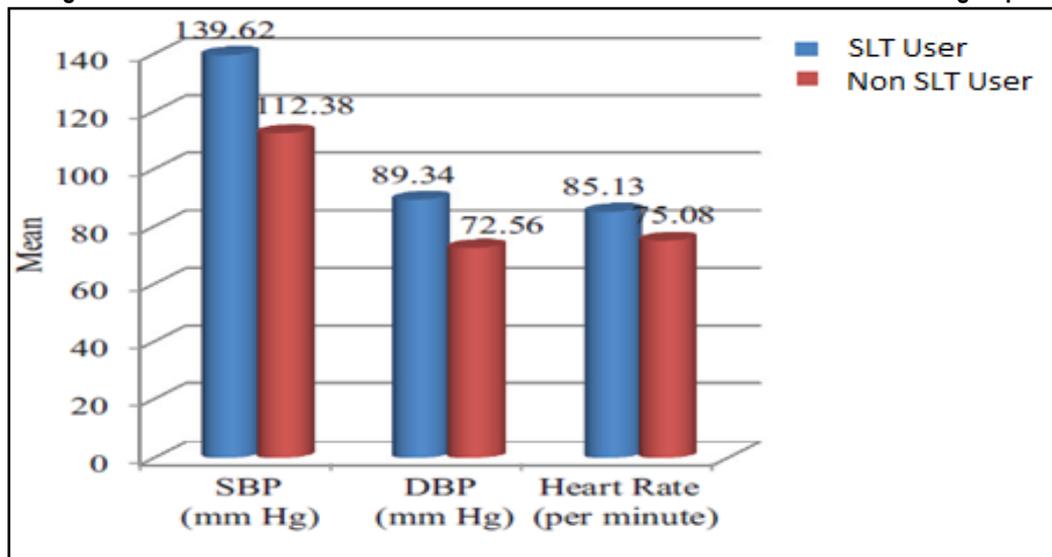
Table 5: Bundle branch block observed in Smokeless tobacco and non Smokeless tobacco

Block	SLT user (Number of patients (%) (N=100)	Non-SLT user tobacco (Number of patients (%) (N=100)
No Changes	90 (90.0%)	100
Change	10 (10.0%)	0
Change Right bundle branch block	6 (6.0%)	0
Change Left bundle branch block	3 (3.0%)	0
Change Bifascicular block	1 (1.0%)	0

Table 6: Showing Ventricular Hypertrophy findings in both groups

Ventricular Hypertrophy	SLT user (Number of patients (%) (N=100)	Non-SLT user (Number of patients (%) (N=100)
No	89 (89.0%)	100 (100.0%)
LVH	10	0
RVH	1	0

Figure 1: Mean SBP DBP and Pulse in Smokeless tobacco and non-smokeless tobacco groups



RESULTS

There is statistically significant difference in both groups. ($p < 0.001$); the people in non slt users group were younger as compared to Smokeless tobacco users. Gender distribution pattern amongst male and female is also statistically significant in both groups ($p < 0.05$), the non slt users group has more females as compared to slt users group. (Table 1)

The pulse rate, systolic blood pressure, diastolic blood pressure is significantly high among Smokeless tobacco users as compared to non-smokeless tobacco users ($P < 0.001$)(figure1)

Smokeless tobacco users have significantly higher p wave voltage, short QRS and QT intervals ($p < 0.05$) and short PR interval ($p < 0.001$) as compared to non-smokeless tobacco users (table 2). None of the non-slt user had any ST elevation or depression as compared to Smokeless tobacco where 23% had such changes (table 3). None of the non slt user had T wave abnormality as compared to slt group; wherein 22% had such abnormalities (table 4). 10 percent of Smokeless tobacco users had bundle branch block. Right bundle branch block was most common occurrence. None of the non-slt user had such ECG changes (table 5,6). 10% of Smokeless tobacco users had Left ventricular hypertrophy and 1% had right ventricular hypertrophy. No such changes were observed in non-smokeless tobacco users.

DISCUSSION

In this prospective case control study done at department of cardiology S. P. Medical College, Bikaner. Total 200 people were enrolled for study; who were asymptomatic for cardiovascular illness. Their average age was 43.54 ± 14.7 years and 139 (65.5%) were male and remaining 69 (34.5%) were females, and then divided according to their chewing status. The subjects included in this study were mostly from the middle or poor socio-economic strata and most of them belonged to rural background. In slt groups, mostly 49% patients were in age between 41 to 60 years and mean age of Smokeless tobacco users (both male and female included) was 49.14 ± 14.12 years as against that mean age of non-Smokeless tobacco users was 37.93 ± 13.23 years. There is statistically significant difference in both groups. ($p < 0.001$); the people in non-slt user group were younger as compared to Smokeless tobacco users. Gender distribution pattern amongst male and female is also statistically significant in both groups ($p < 0.05$). Hence the non-slt user group has more females as compared to slt group. (Table 1) As this hospital based study group is not representative of the entire population the demographic profile cannot be compared with other population based studies. Global adult tobacco survey conducted in 2010 shows the prevalence of chewing in males is variable from 9% to

37.4% in males and 3-9% in females. In males, maximum numbers of Smokeless tobacco were observed in age group 45-65 years and in females in a more than 50 years age; this difference could be attributed to socio cultural reasons. In western studies and according to WHO fact sheet this more incidence of chewing is reported at a younger age group in western world, where youth are much more independent at a younger age.

The present study shows that pulse rate, systolic blood pressure, diastolic blood pressure is significantly high among Smokeless tobacco as compared to non-Smokeless tobacco ($P < 0.001$) (fig.1) In the year 5 of CARDIA study on 3366 young silt heart rate at rest was significantly higher in Smokeless tobacco by 1.5 to 5 beats/min in all race/gender groups except black. However, this study did not show any significant difference in systolic BP of Smokeless tobacco as compared to non-smokeless tobacco.⁵ A significant increase in resting heart is observed by other Indian authors also.⁶

This increase in resting heart rate is an indicator of high sympathetic tone. Increase in heart rate could be due to stimulation of sympathetic ganglia and discharge of catecholamines from adrenal medulla. It has since long been known that blood pressure and heart rate increase during chewing.⁷

These effects are specifically associated with nicotine while the other components of smoke seem to be of minor importance. The rise in blood pressure is due both to an increase in cardiac output and total peripheral vascular resistance. The blood pressure rise appears immediately and occurs before any increase in circulating catecholamines.⁸

Many studies show that BP gets paradoxically reduced while chewing but long-term use causes hypertension.⁹ It is also found in many studies that risk of development of cardiovascular disease is related to number of SLTs smoked.¹⁰

Smokeless tobacco have significantly higher p wave voltage, short QRS and QT intervals ($p < 0.05$) and short PR interval ($p < 0.001$) as compared to non-Smokeless tobacco. (Table 2) None of the non-silt user had any ST elevation or depression as compared to Smokeless tobacco where 23% had such changes (Table 3). None of the non-silt user had T wave abnormality as compared to silt group; wherein 22% had such abnormalities (Table 4). 10 percent of Smokeless tobacco had bundle branch block out of which Right bundle branch block was major finding (Table 5). 10% of Smokeless tobacco had Left ventricular hypertrophy and 1% had right ventricular hypertrophy. (Table 6)

In this case-control study, abnormal ECG parameters were prevalent in Smokeless tobacco as compared to non-Smokeless tobacco and findings corresponds with Sharma et al study who also commented increased heart rate and QTc-interval with increase in pack years of chewing more commonly in female. Increase P-wave amplitude found in males with increase in the number of pack years. Along with that P-wave duration, PR-interval, QRS-duration and RR-interval tended to decrease more in females with increase pack year as compared to males with similar number of pack years and QT-interval and ST-segment duration tended to decrease in males with increase pack years.

Increase in P-wave amplitude noted in present study was in accordance with that reported by Sharma et al. This might be due to the reduced right ventricular compliance and subsequent right atrial hypertrophy due to chronic chewing.¹¹

CONCLUSION

ECG is an important tool in predicting cardiovascular morbidity in Smokeless tobacco users. Not only the ST-T changes or chamber hypertrophy but also resting heart rate PR interval and QT intervals should be measured in Smokeless tobacco users periodically to predict cardiovascular involvement early.

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