EFFECT OF CHEWING TOBACCO ON PULMONARY FUNCTIONS IN BIKANER CITY POPULATION

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ABSTRACT

Background: Smokeless tobacco use (SLT) has been increased rapidly throughout the world, especially among adolescent boys and young men by considering it as safe alternatives of smoking. Because of vigorous efforts toward increasing awareness of the adverse effects of tobacco, smoking has been declined and paradoxically the use of SLT has been greatly increased. This study attempts to find out whether 'chewing tobacco' causes any adverse effects on the lungs by using pulmonary function tests (PFTs).
Material & Methods: The present study has been conducted on the population of Bikaner city (Rajasthan) aged between eighteen years to fifty five years. Each group (study & control) was further sub-divided on the basis of age in two sub-groups, i.e. group I (18-35 years) and group II (36-55years) comprising twenty five subjects each. All the cases were evaluated for Physical parameters- Height, weight, body mass index, heart rate & blood pressure. Spirometry was done using computerized spirometer.
Results: The mean values of systolic blood pressure in chewing tobacco non-users and users were 121.4±2.859 & 122.0±2.236 in group I, 124.8±3.109 & 125.3±1.815 in group II and the difference of mean values were statistically non-significant (p=0.4442, p=0.5082 in group I & II respectively). The mean values of diastolic blood pressure in chewing tobacco non-users & users were 80.0±0.115 & 80.32±0.748 in group I, 81.28±1.514 & 81.68±1.108 in group II and the difference of mean values was statistically non-significant (p=0.097, p=0.2918 in group I & II respectively). The difference in the mean value of FVC, FEV1, FEF25-75% and PEFR is highly significant (p value <0.0001***, <0.0001***, <0.0001*** and <0.0001*** respectively) in both groups I & II. But the difference of the mean value of FEV1/FVC is non-significant (p=0.3065 NS & p=0.7023 NS) in both groups I & II respectively.
Conclusion: The present study shows that chewing tobacco has the deleterious effect on lung functions. Awareness campaign among youths regarding the deleterious effect of tobacco may lower the trend of using chewing tobacco products.

Key-words: Tobacco chewers, Pulmonary Function Tests, BMI, SBP, DBP

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INTRODUCTION

Tobacco use is a public health concern worldwide as well as in India. Tobacco consumption is mainly done in two forms: smoked tobacco and smokeless tobacco. The tobacco use without burning is referred to as smokeless tobacco (SLT) use. SLT use has been increased rapidly throughout the world, especially among adolescent boys and young men by considering it as safe alternative of smoking. Because of vigorous efforts toward increasing awareness of the adverse effects of tobacco, smoking has been declined and paradoxically the use of SLT has been greatly increased.[1] Education standard has been found worse among 'khaini' users in comparison with its nonuser counterpart. Expenditure on tobacco has been found significantly higher in proportion of their daily income in the India.[2] Use of smokeless tobacco indeed represents a health concern of growing magnitude among these groups.

The status of pulmonary functions is useful physiological markers of status of lungs, and other organ tissue damage and dysfunction. In view of the various pharmacological actions of nicotine and additives and the wide use in many regions and countries, chronic consumption of SLT may affect the status of pulmonary functions. This study attempts to find out whether 'chewing tobacco' causes any adverse effects on the lungs by using pulmonary function tests (PFTs).

MATERIAL & METHODS

The present cross sectional study has been conducted on the population of Bikaner city (Rajasthan) aged between eighteen years to fifty five years in the Department of Physiology, S.P. Medical College, Bikaner on hundred subjects, i.e. fifty chewing tobacco users (study group) and another fifty were non-users of tobacco by chewing or active or passive smokers (control group). Each group (study & control) was further sub-divided on the basis of age in two sub-groups, i.e. group I (18-35 years) and group II (36-55years) comprising twenty five subjects each. All the cases were evaluated for Physical parameter- Height, weight, body mass index, heart rate & blood pressure. Computerized Spirometry is one of the most important and frequently used diagnostic tests of pulmonary functions. Spirometer was used to measure the values of air inspired and expired by the lungs.

Selection Criteria for Study Group

1. Age should be between eighteen to fifty five years.
2. Exclusive smokeless tobacco users for at least last five years.
3. Physically and mentally capable of adequate co-operation during the performance of the tests.
4. Body mass index should be within normal range.
5. The subject was selected randomly from the population of Bikaner City.

Selection Criteria for Control Group

1. Same age group as a study group.
2. Same Socioeconomic Status.
3. Subjects who had never taken any type of tobacco in any form.
4. Body mass index should be within normal range.

Exclusion Criteria

1. Smokers (Active as well as Passive).
2. Presence of any self reported acute illness, lung diseases, heart diseases, malignancy, chronic liver or kidney failure, diabetes mellitus, obesity, history of heavy alcohol consumption was excluded from the study.

RESULTS

In this study showed the mean value of BMI in chewing tobacco non-users was 22.77±0.5054 & 22.45±0.8629 in group I & group II respectively. In chewing tobacco users was 22.66±0.5887 & 22.35±0.5986 in group I & group II, respectively, But the difference of the mean value of BMI is statistically non-significant in both group I (p=0.4946 NS) & group II (p=0.6470). (Table-1) The mean values of systolic blood pressure in chewing tobacco non-users and users were 121.4±2.859 & 122.0±2.236 in group I, 124.8±3.109 & 125.3±1.815 in group II and the difference of mean values were statistically non-significant (p=0.4442, p=0.5082 in group I & II respectively). The mean values of diastolic blood pressure in chewing tobacco non-users & users were 80.0±0.115 & 80.32±0.748 in group I, 81.28±1.514 & 81.68±1.108 in group II and the difference of mean values were statistically non-significant (p=0.097, p=0.2918 in group I & II respectively) (Table-2).

The mean values of Pulmonary function parameters in group I as FVC, FEV1, FEV1/FVC, FEF25-75% and PEFR are 96.28±5.89, 111.2±7.82, 115.4±3.124, 112.7±8.92 and 105.4±6.17 respectively in chewing tobacco non-users and 88.24±6.98, 100.6±6.819, 114.2±4.893, 93.16±7.01 and 88.24±6.353 respectively in chewing tobacco users. The difference in the mean value of FVC, FEV1, FEF25-75% and PEFR is highly significant (p value <0.0001***, <0.0001***, <0.0001*** and <0.0001*** respectively). But the difference in the mean value of FEV1/FVC is non-significant (p=0.3065 NS) in between chewing tobacco non-users and users in group I (Table-3). The mean values of Pulmonary function parameters in group II as FVC, FEV1, FEV1/FVC, FEF25-75% and PEFR are 82.88±3.81, 96.24±6.359, 116.2±5.228, 98.52±11.25 and 92.24±6.59 respectively in chewing tobacco non-users and 70.36±6.66, 82.8±6.48, 116.9±7.767, 85.96±9.92 and 81.44±9.25 respectively in chewing tobacco users. The difference in the mean value of FVC, FEV1, FEF25-75% and PEFR are highly significant (p value <0.0001***, <0.0001***, 0.0001*** and <0.0001*** respectively). But the difference in the mean value of FEV1/FVC is non-significant (p=0.7023 NS) in between chewing tobacco non-users and users in group II. (Table-4).

DISCUSSION

There was no significant difference in the anthropometric parameters including age, height, weight and BMI. There was no considerable difference between the economic status of control and study group of individuals. Education standard has been found worse among chewing tobacco users in comparison with chewing tobacco non-users counterpart. Expenditure on tobacco has been found significantly higher in proportion of their daily income in India.[2] Similar findings were suggested by Roobanet al[3], Purushottam Pramanik et

al[4], and Dr.Rajesh Shrivastava et al.[5] Rooban et al[3] observed that 34% of the study population (15 years or older) exposed chewable smokeless tobacco. Smokeless tobacco consumption was significantly higher in poor socioeconomic status, illiterate populations. Similar results of prevalence, the socioeconomic status and demographic correlations were found by Rajesh Shrivastava et al.[5] Prevalence of tobacco chewing is highest in lower middle class and in males.[5] In the study done by Rajesh Shrivastava et al,[5] the systolic and diastolic blood pressure was normal in control group (127± 15.2 and 81.0± 10.2) but in tobacco chewers it was high (129.5± 17.2 and 85.6± 9.3). Systolic and diastolic blood pressure was also seen higher in tobacco smokers (131.5±15.4 and 84.0± 7.2). In group-2, slight increased heart rate was seen, which was not significant.

The present study shows that all pulmonary function parameters except FEV1/ FVC shows statistically significant difference between chewing tobacco users and non-users. There was impairment of pulmonary functions in chewing tobacco users. The difference of the mean value of pulmonary function parameters as FVC, FEV1, FEF25-75% and PEFR was highly significant in between chewing tobacco non-users and users, but the difference of the mean value of FEV1/FVC was non-significant in both groups I & II. Pulmonary function indices showed negative correlation with age. Purushottam Pramanik ET al[4] did a study to evaluate the Effect of 'khaini,' which is a form of smokeless chewing tobacco on pulmonary functions.

There was no significant difference in the anthropometric parameters including age, height, weight and BMI but all pulmonary function indices except FEV1/FVC showed statistically significant difference between 'khaini' users and nonusers. The cause may be a lack of intake of antioxidant rich food in their diet. Smokeless tobacco produces oxidative stress resulting from an imbalance between the formation of reactive oxygen species and antioxidants contributing chronic airway limitation.[6] Smokeless tobacco impairs the antioxidant defenses in the liver, lungs, and kidneys of rats.[7] Antioxidant rich foods such as green-leafy vegetables and fruits that may help to reduce the oxidative stress caused by tobacco are usually lacking in the diet of studied subjects.[8] This makes them more vulnerable to tobacco-induced oxidative stress. Thus 'khaini' induced low pulmonary function indices may be due to increased oxidative stress.[4] Similar findings were also suggested by Maduka et al,[9] who showed statistically significant impairment of lung functions of workers chronically exposed to snuff. FVC, FEV1 and PEFR in the exposed (test) subjects were significantly decreased in comparison with the control subjects ($P<0.05$). However, the mean value of FEV1/FVC (%) of the test subjects was 86.8%, which was within the normal range and was not significantly different from control. This signified that the test subjects had a restrictive pattern of lung function defect.

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The present study shows that all pulmonary function parameters except FEV1/ FVC shows statistically significant difference between chewing tobacco users and non-users. There was an impairment of pulmonary functions in chewing tobacco users. The difference of the mean value of pulmonary function parameters as FVC, FEV1, FEF25-75% and PEFR was highly significant in between chewing tobacco non-users & users, but the difference of the mean value of FEV1/FVC was non-significant in both groups I & II. Pulmonary function indices showed negative correlation with age. Purushottam Pramanik at al[4] did a study to evaluate the Effect of 'khaini' – a form of smokeless chewing tobacco on pulmonary functions. There was no significant difference in the anthropometric parameters including age, height, weight and BMI but all pulmonary function indices except FEV1/FVC showed statistically significant difference between 'khaini' users and nonusers. The cause may be a lack of intake of antioxidant rich food in their diet. Smokeless tobacco produces oxidative stress resulting from an imbalance between the formation of reactive oxygen species and antioxidants contribute chronic airway limitation.[6] Smokeless tobacco impairs the antioxidant defenses in liver, lung, and kidney of rats.[7] Antioxidant rich foods such as green-leafy vegetables and fruits that may help to reduce the oxidative stress caused by tobacco[8]are usually lacking in the diet of the studied subjects. This makes them more vulnerable to tobacco-induced oxidative stress. Thus 'khaini' induced low pulmonary function indices may be due to increased oxidative stress.[4] Similar findings were suggested by Maduka et al[9] showed statistically significant impairment of lung function of workers who have taken snuff chronically. FEV1, FVC and PEFR in the exposed (test) subjects were significantly decreased in comparison with the control subjects ($P<0.05$). However, the mean value of FEV1/FVC (%) of the test subjects was 86.8%, which was within the normal range and was not significantly different from control. This signified that the test subjects had a restrictive pattern of lung function defect.

CONCLUSION

The present study shows that chewing tobacco has the deleterious effect on lung functions. Awareness campaign among youths regarding the deleterious effect of tobacco may lower the trend of using chewing tobacco products.

Table-1 : Shows the BMI (mean ± SD) in Chewing tobacco non-users and users

Age group	Chewing tobacco nonusers BMI(kg/m$^{2)}$	Chewing tobacco users BMI(kg/m$^{2)}$	p-value
Group I (18-35 years)	22.77 ± 0.5054	22.66 ± 0.5887	0.4946 NS
Group II (36-55 years)	22.45 ± 0.8629	22.35 ± 0.5986	0.6470 NS

Table-2 : Shows the Blood Pressure (mean ± SD) in Chewing tobacco non-users and users

Agegroup	Chewing tobacco nonusers		Chewing tobacco users		p-value (SBP)	p-value (DBP)
	SBP (mmHg)	DBP (mmHg)	SBP (mmHg)	DBP (mmHg)		
Group I (18-35 years)	121.4 ± 2.859	80.0 ± 0.1155	122.0 ± 2.236	80.32 ± 0.748	0.4442 NS	0.0970 NS
Group II (36-55 years)	124.8 ± 3.109	81.28 ± 1.514	125.3 ± 1.815	81.68 ± 1.108	0.5082 NS	0.2918 NS

Table-3 : Shows the Pulmonary function parameters (% predicted values) analysis (mean ± SD) in Chewing tobacco non-users and users in Group I

Pulmonary function parameters	Chewing tobacco non-users (Mean±S.D)	Chewing tobacco users (Mean±S.D)	t Value	p Value
FVC	96.28±5.899	88.24±6.984	4.398	<0.0001***
FEV_1	111.2±7.826	100.6±6.819	5.106	<0.0001***
FEV_1/ FVC	115.4±3.124	114.2±4.893	1.034	0.3065NS
$FEF_{25-75\%}$	112.7±8.924	93.16±7.016	8.598	<0.0001***
PEFR	105.4±6.170	88.24±6.353	9.666	<0.0001***

Table 4: Shows the Pulmonary function parameters (% predicted values) analysis (mean ± SD) in Chewing tobacco non-users and users in Group II

Pulmonary function parameters	Chewing tobacco non-users (Mean±S.D)	Chewing tobacco users (Mean±S.D)	t-Value	p-Value

FVC	82.88±3.811	70.36±6.664	8.154	<0.0001***
FEV_1	96.24±6.359	82.80±6.481	7.401	<0.0001***
FEV_1/ FVC	116.9±5.228	116.2±7.767	0.3845	0.7023NS
$FEF_{25-75\%}$	98.52±11.25	85.96±9.927	4.186	0.0001 ***
PEFR	94.24±6.591	81.44±9.251	5.634	<0.0001 ***

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REFERENCES

1. Gupta R, Gurm H, Bartholomew JR. Smokeless tobacco and cardiovascular risk. Arch Intern Med 2004; 164:1845–49.
2. Efroymson D, FitzGerald S. Tobacco and poverty: Observation from India and Bangladesh. Path Can 2003; 10:56-60.
3. T Rooban, J Elizabeth, KR Umadevi, K Ranganathan. Sociodemographic correlates of male chewable smokeless tobacco users in India: A preliminary report of analysis of national family health survey, 2005-2006; Smokeless Tobacco, 2010; 47 (5): 91-110.
4. Pramanik P, Ghosh M, Choudhary A, Ghosh B, Ganguli IN. Effect of 'khaini' – a form of smokeless chewing tobacco on pulmonary functions. Ind J Physiol & Pharmacol 2013; 57(1): 84–86.
5. Shrivastava RK, Jha RK, Kumar R. Comparative Study of Tobacco Chewer & Smokers as a Risk Factor For Cardiovascular Disease. Ind J of Applied Res, Jan 2014; 4(1): 1-6.
6. Schunemann J, Freudenheim JL, Grant BJB. Epidemiologic evidence linking antioxidantvitamins to pulmonary function and airwayobstruction. Epidemiol Rev 2001; 23: 248–261.
7. Avti PR, Kumar S, Pathak CM, Vaiphei K, Khanduja KL. Smokeless tobacco impairs the antioxidant defense in liver, lung, and kidney of rats, Toxicol Sci. 2006; 89(2):547-553. 49.
8. Chopra M, O'Neill M, Keogh N, et al. Influenceof increased fruit and vegetable intake on plasmaand lipoprotein carotenoids and LDL oxidationin smokers and nonsmokers. Clin Chem 2000; 46: 1818-1829.
9. Maduka SO, Osim EE, Nneli RO, Anyabolu AE. Effect of occupational exposure to local powdered tobacco (snuff) on pulmonary function in south eastern Nigerians. Niger J Physiol Sci. 2009 Dec;24 (2):195-202.