Research Article

Effect of betel nut quid chewing on cardiovascular and respiratory changes on sanitary workers of kanchipuram municipality

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ABSTRACT

Background: The handling and disposal of municipal solid waste is becoming a natural and a general well-being concern. An alarming increase in the morbidity and mortality from respiratory diseases is due to the exposure of the sanitary workers, to the contamination of atmospheric oxygen that is ambient and particulate. Due to their introduction to numerous hazard factors, they endure high rates of occupational medical issues. In the total populations about 10% of them having the habit of betel quid chewing. Areca nut is the seed of the palm tree *Areca catechu*, which is the fourth most commonly used psychoactive substance, next to caffeine, nicotine, and alcohol. The recent investigations propose that the usage of betel nut remains as a major cause for the onset of such systemic diseases as metabolic and cardiorespiratory ailments. **Aim:** This study was aimed to understand the effects of betel chewing which, in turn, causes cardiovascular and respiratory changes on sanitary workers of Kanchipuram municipality. **Materials and Methods:** It is a comparative study analysis, in which nearly 100 sanitary workers actively participated and the following data were obtained based on blood pressure and pulse using sphygmomanometer. Mean arterial pressure and pulse pressure were also calculated from the anthropometry measurements measured using height and weight machine. The pulmonary function test was obtained using computerized spirometer - HELIOS 701. The sanitary workers were divided into two groups such as 50 betel chewing sanitary workers (Group 1) and 50 non-betel chewing sanitary workers (Group-2). Pulmonary test parameters such as forced vital capacity (FVC), forced expiratory volume in the first second (FEV1), peak expiratory flow rate (PEFR), FEV1 to FVC, PEFR ($FEFR_{25-75}$), and respiratory endurances were compared with the two groups and the results were obtained. **Results:** On comparing the cardiovascular and respiratory parameters of the sanitary workers, the result showed many significant changes between the non-betel groups and betel chewing sanitary workers. **Conclusion:** The findings of our study clearly showed that both betel and non-betel chewing sanitary workers have cardiopulmonary alteration, but betel chewing sanitary workers have mild reduction with cardiopulmonary parameters than non-betel chewing sanitary workers.

KEY WORDS: Betel chewing, Cardiovascular system, Pulmonary function test, Sanitary workers

INTRODUCTION

Areca nut being the seed of the palm tree *Areca catechu* tends to be the fourth most normally utilized psychoactive substance, after caffeine, nicotine, and alcohol. Since areca nut is often taken for human consumption with the leaf of *Piper betel*, biting of areca nut has been normally been alluded to as "betel nut biting" in the English Literature. There are expected 600 million individuals biting betel nut around the world. It is a typical propensity and is a mode of social interaction in Asia, especially the South Pacific islands, Southeast Asia, Papua New Guinea, Bangladesh, Pakistan, and India.[1-4] Betel nut has been marked by the International Agency for Research on Cancer as a human cancer-causing agent (Carcinogen), with its utilization having been essentially connected to precancerous oral fibrosis and in addition, the malignancy of the oral cavity, pharynx and esophagus. Comparative impacts have been seen in the liver, as an expanded risk of both cirrhosis and hepatocellular carcinoma has been shown among in takers. Betel nut

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biting, an exceptional propensity prominent among inhabitants in South and Southeast Asia, is for the most part accepted to be a hazard factor of creating oral malignancy. The past studies propose that betel nut biting can build body mass index (BMI) or pave a way to central obesity. Weight is an imperative hazard factor for a legion of perpetual ailments, for example, diabetes mellitus, cardiovascular maladies, and hypertension.[5]

Business-related issues are the significant reason for complaints and disability in the population of workers. The fundamental issue experienced in nature is the respirable dust that exists as residue (<10 µm). At the point when fine residue enters the respiratory system, the human body views it as alien material which ought to be defended against. Introduction to surrounding particulate air contamination is related with in morbidity and mortality from respiratory and cardiovascular diseases.[6] Road clearing is related with prolonged exposure to dust, amid clearing the avenues with brooms, and by vehicular development, and additionally, other human exercises which are breathed in by the laborers have raised a few quantum of residue that brought about respiratory issues[7] and lung malignancy and also different kinds of tumors.[8]

Many studies are done to assess the effect of betel nut quid chewing on cardiopulmonary changes in general population, but less there was attention toward sanitary workers who are prone to multiple organ disorders due to their working conditions. Hence, this study was planned to understand the effects of betel chewing on cardiovascular and respiratory changes on sanitary workers of Kanchipuram municipality.

MATERIALS AND METHODS

The study was done on 100 sanitary workers of Kanchipuram Municipality by the Department of Physiology, MMCH and RI. The sanitary workers were classified in two groups with 50 subjects in each group which are as follows: Group I - betel nut quid chewing sanitary workers (50), Group II - non-betel nut quid chewing sanitary workers (50). The study protocol was ethically approved by the institutional ethical committee. All subjects were explained about the procedures to be undertaken. An informed consent of the subject was taken on approved pro forma.

Blood pressure and pulse using sphygmomanometer and pulse pressure (PP) were calculated by differences of systolic blood pressure and diastolic blood pressure (DBP). Mean arterial pressure was obtained by calculating DBP+1/3PP. Pulmonary test parameters such as BMI were calculated dividing the weight by squared height and were compared with the two groups. Pulmonary function test was performed using portable spirometer (HELIOS) which works with the Mini Flow Sensor. All the workers underwent with proper anthropometric assessment which includes height and weight and were trained to do the spirometer procedure. The best value of three attempts was taken, a complete flow loop was obtained. Disposable mouthpiece and other suitable precautions were taken as per the equipment specification of the American thoracic society. The best values of forced vital capacity (FVC), peak expiratory flow rate (PEFR), FVC, forced expiratory volume in the first second (FEV_1), PEFR, FEV1/FVC, PEFR ($FEF_{25-75\%}$), respiratory endurances, chest expansion, and respiratory rate were assessed manually and the results were obtained using SPSS software version 21.0, Students *t*-test.

Inclusion Criteria

Age limit 20–60 years, both the genders, sanitary workers chewing betel nut quid for more than 20 years were included in the study.

Exclusion Criteria

Post-surgery, subject with respiratory disorders, cardiovascular disorder, alcoholic sanitary workers, smoking sanitary workers, and tobacco usage along with betel nut quid were excluded from the study.

RESULTS

Statistical analyzes were done using student 't' test on a comparison between betel nut chewing and non-betel nut chewing sanitary workers on Pulmonary function test and Cardiovascular functions. Betel nut sanitary workers showed changes but significant changes in SBP, DBP, FVC, FEV1 and BMI when compared with non-betel nut chewing sanitary workers [Table-1].

DISCUSSION

This investigation agrees with the findings of Gupta *et al*., which accentuated that betel nut quid contains a specific alkaloid, and its significant constituents - arecoline and arecaidine have the capacity to inhibit gamma-aminobutyric acid (GABA) receptor.

The areca nut contains arecoline which produces a parasympathomimetic effect, wherein the presences of lime, aeroline is hydrolyzed to arecaidine and exert a sympathomimetic effect.[1] In our study, we observed a significant increase with blood pressure parameters [Table 1] which could be due to the sympathomimetic effect produced by the arecaidine and betel piper which would lead to increased heart rate, heart contraction, and vasoconstriction, respectively.[9]

The respiratory parameters such as FVC and FEV_1 were significantly reduced in betel nut quid chewing sanitary workers while the other pulmonary functional parameters of the betel nut quid chewing sanitary workers showed mild variation which can be due to the

Table 1: Comparison between betel nut chewing and non betel nut chewing on PFT and cardiovascular functions

Group	Mean	SD	SEM	Sig. (two-tailed)
SBP				
Betal	136.000	16.3881	4.2314	0.006**
Non-betal	119.667	13.6887	3.5344	
DBP				
Betal	80.000	10.0000	2.5820	0.029**
Non-betal	71.333	10.6010	2.7372	
Pulse				
Betal	85.267	18.0098	4.6501	0.544
Non-betal	81.667	13.8237	3.5693	
RR				
Betal	21.267	4.5898	1.1851	0.927
Non-betal	21.133	3.2042	0.8273	
Chestex				
Betal	1.300	0.5278	0.1363	0.868
Non-betal	1.333	0.5563	0.1436	
BHT				
Betal	23.527	8.5521	2.2082	0.174
Non-betal	28.713	11.5691	2.9871	
End				
Betal	26.413	14.7045	3.7967	0.111
Non-betal	18.920	9.7552	2.5188	
FVC				
Betal	75.267	17.0565	4.4040	0.001**
Nonbetal	93.267	9.7649	2.5213	
FEV1				
Betal	81.200	36.9907	9.5510	0.011**
Non-betal	109.067	14.1394	3.6508	
FEV1-FVC				
Betal	106.200	39.2650	10.1382	0.316
Non-betal	116.733	7.5353	1.9456	
FEF2575				
Betal	122.733	44.7397	11.5517	0.652
Non-betal	116.133	33.7382	8.7112	
PEFR				
Betal	86.200	22.4569	5.7984	0.674
Non-betal	89.067	13.3388	3.4441	
BMI				
Betal	27.4500	5.62841	1.45325	0.022**
Non-betal	23.3827	3.26894	0.84404	

The mean difference is significant at $P<0.05$ **highly significant, *significant

parasympathomimetic effect of arecoline which brings bronchoconstriction. Moreover, in pro-inflammatory circumstances, the arecoline activates the NF-kappa B and ROS genesis which brings airway remodeling and led to bronchoconstriction; hence, this could be the cause for the alteration seen in the pulmonary functional values which were studied by Tsu-Nai-Wang *et al*.[10] Moreover, since the sanitary workers are exposed to many environmental pollution, dust particle and other harmful gases which cause shrinking of alveoli due to release of cytokines and other inflammatory mediators that led to allergic reaction and produce changes in the respiratory system.

According to Choudhurry *et al*., there was a significant increase in BMI in betel nut quid chewing sanitary workers and this may be due to arecoline which inhibits cholesterol uptake by inhibiting the endocytosis of the low-density lipoprotein which could lead to hyperlipidemia, hyperglycemia, and insulin intolerances.[11] Chu *et al*. have also explained that this sympathomimetic effect of arecardine can also lead increased glucose and lipid level in blood and cause hyperglycemia and hyperlipidemia.[9] Development of obesity and diabetes mellitus may be also due to the arecardine which inhibiting GABA uptake and have its effect on the somatostatin which increases the appetite and insulin intolerances.[12] Similarly, Jeng *et al*., 2003, have given an explanation that diabetes mellitus can also be developed by the inflammatory mediators such as interleukin-6 and tumor necrosis factor-alpha which are released on betel nut quid chewing.[13]

CONCLUSION

This study concludes that the sanitary workers chewing betel nut have high risk of obesity, hypertension, as well as obstructive type of pulmonary changes as an occupational hazard. This might lead to either oral cancer or other types of cancer in prolonged usage.

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