Oral Health Status of Psychoactive Substance Abusers

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ABSTRACT

Introduction: Among varied substance abuse, tobacco abuse is a common relapsing addiction among youth. The relationship of tobacco abuse in varying grades of dental caries (DC) is worthy of study. This study was planned with a null hypothesis, there is no difference in varying grades of DC in tobacco and related substance abusers to those of nonabusers in the population visiting institute. **Materials and Methods:** The present study comprised 270 adults, 135 participants in each group, with age ranged from 20 years to 50 years including both gender. Study group formed of smokers, tobacco abusers, smokeless tobacco abusers, gutka, betel nut, and a combination of these two, whereas the healthy, nonhabit group formed control. DC was measured using the decayed, missing, and filled teeth (DMFT) index. Oral hygiene was evaluated by recording a simplified Oral Hygiene Index (OHI). **Results:** DC was found higher in individuals with habits (mean DMFT: 4.73 ± 4.32) as compared to those of nonhabit group (mean DMFT: 3.17 ± 3.11), and the difference was statistically significant ($P = 0.001$). OHI was significantly higher in tobacco abusers than those of nonabusers ($P = 0.0001$). In the case of both moderate and severe caries, the duration and frequency of tobacco abuse was significantly associated with a pattern of DC ($P = 0.001$). As the frequency of tobacco and related substance abuse increased, caries (DMFT) also increased ($r = 0.15$ and $P = 0.013$), and it was statistically highly significant. **Conclusion:** Psychoactive substance abuse along with poor oral hygiene, in any form of smokeless or smoking form of tobacco habit, is a risk for increased caries activity, and it is higher in smokeless tobacco abusers as compared to smokers.

KEYWORDS: *Decayed, missing, and, filled teeth index, dental caries, oral hygiene index, psychoactive substance abuse*

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INTRODUCTION

Dental caries (DC) is a major health problem affecting all age groups, gender, and races with manifestations persisting throughout life despite treatment. It is a complex and dynamic process where a multitude of factors initiate and influence the progression of the disease. It results from a complex interaction of diet, the normal bacterial flora, and the host.[1] It is important to identify the exact etiology as well as modifiable risk factors for caries.[1]

DC if left untreated can result in substantial morbidity due to pain, dysfunction, poor appearance, and possibly problems with speech development.[2] Hence, it becomes important to identify the exact etiology and modifiable risk factors for caries. In spite of known effective methods for the prevention and management of DC, it continues to be a global burden.[1]

Oral health neglect is a common feature of psychoactive substance (PS) abuse.[1] While DC is all pervading in

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highly industrialized societies, the caries experience varies greatly among communities and with socioeconomically varied populations.

In many Asian countries including India, tobacco in smoking and chewing has been practiced for a long time irrespective of its ill effects in any form.[3] According to the World Health Organization estimates, globally, there were 100 million premature deaths due to tobacco in the 20th century, and if the current trend of tobacco use continues, this number is expected to rise to 1 billion in the 21st century irrespective of a global commitment to reversing the tobacco epidemic made in 2003.[4,5]

According to current trends, the mortality rate is expected to reach 10 million by the year 2030, with 70% of deaths occurring in low- and middle-income countries.[6] Tobacco is mainly used in smoking cigarettes, cigars, beedis, and pipe tobacco and smokeless forms are gutka, Khaini, gul, pan masala, and plain tobacco.

The relationship of PS abuse to DC is a matter of debate till date. Given the paucity of this information, a hospital-based cross-sectional study was planned to evaluate the association of PS abuse to DC, stating the null hypothesis, as there is no difference in DC activity in substance abusers as compared to nonusers in participants visiting K. M. Shah Dental College and Hospital.

Materials and Methods

The present cross-sectional study comprised 135 healthy participants nonusers of PS as healthy controls and 135 participants using tobacco, alcohol, and areca nut in any form, recruited from the Outpatient Department of K M Shah Dental College and Hospital. All the participants with their consent were screened by a single trained examiner, the intraclass calibration coefficient for intraexaminer reliability was 0.93, indicating that the examiner was trained sufficiently. Dentate participants in the age range of 20–50 years, using tobacco and/or related substances for a minimum of 5 years, residents of Piparia village, Vadodara city, and consuming only municipal water were included in the study. Occasional tobacco abusers and participants with special health-care needs (e.g., cleft lip and palate syndromes and medically and physically challenged) were excluded from the study.

A brief case history including tobacco and related substance habits for both smoking and smokeless tobacco abusers comprising duration, frequency, the quantity of tobacco, and related product intake was recorded in the prescribed proformas.

Each participant was examined on a dental chair with light using appropriate diagnostic aids, and oral hygiene status was scored using Oral Hygiene Index-Simplified (OHI-S). Decayed, missing, and filled teeth (DMFT) index was used to record DC and its pattern, and participants were categorized into three groups: Group I: No caries group: DMFT <1; Group II: Moderate caries group: DMFT >1 and <6; and Group III: Severe caries group: DMFT >6. The OHI-S value comprised debris index simplified and calculus index simplified and it ranged from 0 to 6 which were interpreted as: good – 0–1.2; fair – 1.3–3; and poor – 3.1–6. The time required for clinical examination and recording varied from 10 to 15 min.

All the data were entered into Microsoft Excel and analyzed using SPSS version 20.0 (SPSS Inc., Chicago, Illinois, USA). The data were statistically analyzed using descriptive statistics, Chi-square *t*-test, analysis of variance, and binary regression analysis. $P < 0.05$ was considered statistically significant.

Ethical approval for this study (Sumandeep Vidyapeeth Institutional Ethics Committee) was provided by the Ethical Committee of Sumandeep Vidyapeeth Deemed to be University, SVIEC on 31st August 2021.

Results

In the present study, among the 270 participants, the mean age was 32.53 years and the majority were in the age range of 20–29. Tobacco abuse was the most common reported habit and was predominant in males [$P = 0.001$, Table 1]. The most commonly consumed smokeless tobacco was pan masala with tobacco (gutka). In the study group, among all participants, tobacco abuse was followed by gutka, smoking, betel nut, and lastly, mixed products. However, among the male participants, gutka

Table 1: Gender distribution as per decayed, missing, and filled teeth categorization among total population

Gender	Grade of DMFT			Total	*P*	χ^2
	No caries, *n* (%)	Moderate caries, *n* (%)	Severe caries, *n* (%)			
Male	52 (31.90)	57 (34.97)	54 (33.13)	163	0.745	4.211
Female	38 (35.51)	33 (30.84)	36 (33.64)	107		
Total	90 (33.33)	90 (33.33)	90 (33.33)	270		

DMFT=Decayed, missing, and filled teeth

abuse was most common followed by tobacco and smoking [Table 2].

In the present study, the mean DMFT in tobacco abusers was significantly higher than those of nonabusers [P = 0.0010, Tables 3 and 4]. A statistically significant difference was found between total decayed teeth, total missing teeth, and total filled teeth among tobacco abusers to those of nonabusers. As the frequency of tobacco and related substance abuse increased, there was a statistically significant increase in caries (DMFT) [r = 0.15 and P = 0.013, Table 5]. Further, in moderate and severe DMFT, duration and frequency of tobacco abuse was significantly associated with a pattern of DC (P = 0.001). DMFT score increased with the duration of tobacco substance abuse (r = 0.24 and P = 0.0001) and it was statistically highly significant.

With gutka abuse (r = 0.17 and P = 0.005), a low degree of positive correlation was found and it was statistically highly significant. With tobacco substance abuse, there was an increase in DC (r = 0.05 and P = 0.384) but it was not statistically significant. Binary regression analysis [Table 6] showed an odds ratio of 0.123 (i.e., tobacco chewers were 0.123 times more prone to get DC than nontobacco chewers, gutka abusers were 0.217 times more prone to get DC than nongutka abusers, similarly, smokers were 0.085 times, betel nut abuser were 0.057 times, and mixed habit abusers were 0.050 times more prone to get DC than those of nonusers.

OHI was significantly higher in tobacco abusers than those of nonabusers (P = 0.0001). In Group I (no caries group), the OHI was good; as the grade of DMFT increased the OHI was found to be poor [Table 7]. The difference of DC and its association with OHI was statistically significant among tobacco abusers to those of nonusers. OHI was found to be poor with an increase in frequency and duration of tobacco abusers as compared to those of nonabusers and the difference was statistically significant (P = 0.001).

Table 2: Distribution of gender and tobacco abuse

Type of habit	Male, *n* (%)	Female, *n* (%)	Total, *n* (%)	*P*
No habit	58 (35.58)	77 (71.96)	135 (50.00)	0.001
Tobacco (padiki)	35 (21.47)	17 (15.89)	52 (13.70)	
Gutkha	43 (26.38)	6 (5.61)	49 (25.19)	
Smoking	25 (15.34)	1 (0.93)	26 (10.74)	
Betel nuts	0 (0.00)	5 (4.67)	5 (0.37)	
Mixed	2 (1.23)	1 (0.93)	3 (1.11)	
Total	163	107	270	

Discussion

PS abuse is a disorder characterized by repetitive substance use that results in social or economic distress and that causes damage to physical or mental health. The common PS abuse that is of interest to a dentist in India includes alcohol, tobacco, and areca nut.[1,7] The substances or drugs may be natural or synthetic, the use of which has a psychoactive effect and alters or modifies the functions of a living organism. Tobacco is detrimental to overall human health and any form of tobacco abuse leads to sinister effects in the oral cavity. Substance abuse both as smoking and smokeless tobacco forms can lead to poor oral hygiene and furthermore DC. DC being a multifactorial disease of lifestyle, socioeconomic, and sociodemographic gradients, tobacco abuse acts as a confounding factor.

The prevalence of DC in the present study was found to be 66.33%, and the majority of the participants (24.1%) were in the age range of 36–40 years with a mean age of 38.49 years. These findings are in accordance with that reported by Rooban *et al*.,[1] who also reported the mean age as 32.78 years. It is higher than the reported prevalence in India in various age groups, indicating that tobacco and related substance abuse play a role in DC and poor oral hygiene. These are also congruent with those of Kumar *et al*.[8] who found tobacco and related substances habit to be most prevalent among 25–35 years of age. Axelsson *et al*.[9] reported the smoking habit in the older age group, in their study of DC among smokers and nonsmokers.

The younger age group involved in tobacco abuse observed in the present study could be due to peer pressure, inability to cope to stresses, media exposure to tobacco and its related products, and ease of availability of

Table 3: Distribution of habit and varying decayed, missing, and filled teeth parameters

Dental caries status	Mean±SD		*t*	dF	*P*	Mean difference	SE difference	95% CI of the difference	
	Tobacco user	Tobacco nonuser						Lower	Upper
Total DMFT	4.73±4.32	3.17±3.11	3.39	243.48	0.0010	1.5556	0.4583	0.6528	2.4583
Total Decayed	2.24±2.05	1.67±1.96	2.37	267.45	0.0190	0.5778	0.2440	0.0974	1.0582
Total Missing	0.58±0.97	0.31±0.83	2.43	262.34	0.0160	0.2667	0.1097	0.0506	0.4828
Total Filled	0.93±1.29	1.47±1.82	−.47±	242.22	0.0050	−.0050.	0.1919	−.1919.	−.1919.
OHI	3.62±1.23	2.64±1.11	6.87	265.18	0.0001	0.9776	0.1423	0.6975	1.2578

DMFT=Decayed, missing, and filled teeth; SD=Standard deviation; SE=Standard error; CI=Confidence interval

tobacco and related substances. Another reason observed in the lower economic strata could be the family members exposing the younger ones to tobacco use at an early age.

Table 4: Dental caries in relation to gender and tobacco habits

	DMFT	*P*
Gender		
Male	4.20±3.93	0.184 (NS)
Female	3.57±3.68	
Habit		
Absent	3.17±3.11	0.001 (HS)
Present	4.73±4.32	
Tobacco (padiki)		
Absent	3.85±3.73	0.424 (NS)
Present	4.37±4.26	
Gutka		
Absent	3.64±3.62	0.017 (S)
Present	5.33±4.50	
Smoking		
Absent	3.91±3.82	0.676 (NS)
Present	4.27±4.11	
Betel nut		
Absent	3.93±3.83	0.706 (NS)
Present	4.80±4.76	
Mixed habit		
Absent	3.94±3.83	0.772 (NS)
Present	5.00±5.57	

DMFT=Decayed, missing, and filled teeth; S=Significant; NS=Not significant; HS=Highly significant

Gutka abuse observed in the present study is similar to the findings of studies carried out on street children[10] and adult pavement dwellers[11] in Mumbai, reporting 49% and 20% of gutka consumption, respectively.

An increased DMFT score was observed across various types of tobacco abuse, suggesting that tobacco plays a definitive role in the caries process.[1,12-14] Furthermore, the type of tobacco substance abuse influences the DC occurrence and oral hygiene status.[15-21] Hence, the type of tobacco substance would probably be a major factor in determining the DMFT as well as OHI-S.

In the present study, the DMFT score was high in both smokeless and smoked forms of tobacco as compared to controls. This was in contrast to Rooban *et al.*[1] and Möller *et al.*[22] who reported that continuous chewing of tobacco leads to wear of occlusal surfaces accounting for less DC. The high caries experience observed in the present study could be due to the sweeteners and citric acid in smokeless tobacco as compared to smoked forms of tobacco.

The DMFT score in smokers was less compared to smokeless tobacco abusers, which could be due to thiocyanate concentration, a constituent of tobacco smoke in saliva with a possible caries-inhibiting effect.[1] The findings are contradictory to those of Petersson and

Table 5: Correlation analysis of decayed, missing, and filled teeth

	Frequency_Code	Duration_Code	Total DMFT	Tobacco	Gutka	Smoking	Betal nut	Mixed
Frequency_Code								
Pearson correlation	1.00	0.75	0.15	0.42	0.43	0.33	0.13	0.00
Significant (two-tailed)	-	0.000	0.013	0.000	0.000	0.000	0.036	0.972
Duration_Code								
Pearson correlation	0.75	1.00	0.24	0.42	0.36	0.30	0.05	0.12
Significant (two-tailed)	0.000	-	0.000	0.000	0.000	0.000	0.447	0.053
Total DMFT								
Pearson correlation	0.15	0.24	1.00	0.05	0.17	0.03	0.03	0.03
Significant (two-tailed)	0.013	0.000	-	0.384	0.005	0.655	0.617	0.634
Tobacco								
Pearson correlation	0.42	0.42	0.05	1.00	−0.23	−0.16	−0.07	−0.05
Significant (two-tailed)	0.000	0.000	0.384	-	0.000	0.009	0.272	0.397
Gutka								
Pearson correlation	0.43	0.36	0.17	−0.23	1.00	−0.15	−0.06	−0.05
Significant (two-tailed)	0.000	0.000	0.005	0.000	-	0.011	0.290	0.414
Smoking								
Pearson correlation	0.33	0.30	0.03	−0.16	−0.15	1.00	−0.04	−0.03
Significant (two-tailed)	0.000	0.000	0.655	0.009	0.011	-	0.463	0.571
Betal nut								
Pearson correlation	0.13	0.05	0.03	−0.07	−0.06	−0.04	1.00	−0.01
Significant (two-tailed)	0.036	0.447	0.617	0.272	0.290	0.463	-	0.812
Mixed								
Pearson correlation	0.00	0.12	0.03	−0.05	−0.05	−0.03	−0.01	1.00
Significant (two-tailed)	0.972	0.053	0.634	0.397	0.414	0.571	0.812	-

DMFT = Decayed, missing, and filled teeth

Twetman[23] who reported habitual smoking to have a significant relation to caries increment over a 3-year period in young adults. Thus, smoking is a marker of lifestyle and socioeconomy, exerts biological influence on salivary buffer capacity, and levels of secretory immunoglobulin A.[18]

Frequency and duration of habit was not congruent with the study of Rooban *et al*.[1] who found a higher mean duration of tobacco abuse among the study groups, but did not contributory to the increase in mean DC. Tobacco and related substance abuse would probably be a major factor in determining the DC, DMFT as well as OHI-S. Tobacco and related substance abuse probably influence oral hygiene status and this poor oral hygiene is a cofactor with smokeless tobacco abuse in the development of DC and this finding was in congruence with the study reported by Rooban *et al*.[1] and Offenbacher and Weathers.[24] However, caries risk assessment by Mejàre *et al*.[25] found insufficient evidence to determine the accuracy of oral bacteria and oral hygiene as risk factors for caries.

In the present study, as OHI degraded from good to poor, an increase in DMFT score was noted and this correlation between DMFT and OHI was positive. Poor oral hygiene and increased DMFT could be due to the fact that tobacco abuse induces alteration in the composition of oral microbiome including *Candida*, attributed to the components of tobacco such as nicotine, polycyclic aromatic hydrocarbons, polonium, nitrosodietheinal amine, and nitrosoproline. These act as nutrients for *Candida* species and thus augment their proliferation. Furthermore, nicotine leads to the alteration of local immune function through the impairment of neutrophil function, and subsequently converts the oral flora to opportunistic pathogens, leading to an imbalance between the host and the oral microbiota in favor of oral disease.[26] This explains the increased caries activity observed in PS abuse participants in the present study.

This indicates that tobacco and related substances promote DC both through a direct effect of nicotine on caries-causing bacterial agents, as well as through other systemic physiological changes in the host. Furthermore, lower cystatin activities have been reported in tobacco smokers. Cystatins contribute to balanced oral health by inhibiting certain proteolytic enzymes.[1] There have been contradictory reports of DC in tobacco smokers.[27-30] Furthermore, the decreased buffering effect, possible lower pH of smoker's saliva, and the higher number of lactobacilli and *Streptococcus mutans* indicate an increased susceptibility to caries.

A positive correlation of tobacco abuse with DC observed in the present study is similar to many reported in the literature.[14,15,18,21,31,32] Furthermore, the habits varied significantly and the DMFT score was influenced by the type of tobacco, frequency, and duration of abuse.

Table 6: Odd's ratio

	Unstandardized coefficients		OR	*t*	*P*
	B	SE			
Constant	3.170	0.325		9.748	0.000
Tobacco	1.195	0.617	0.123	1.938	0.054
Gutka	2.156	0.630	0.217	3.421	0.001
Smoking	1.099	0.809	0.085	1.358	0.176
Betal nut	1.630	1.721	0.057	0.947	0.345
Mixed	1.830	2.206	0.050	0.829	0.408

OR=Odds ratio; SE=Standard error

Conclusion

Tobacco habit is a risk factor for increased caries activity and it is higher in smokers as compared to smokeless tobacco chewers. PS abuse along with poor oral hygiene leads to an increase in caries incidence through various mechanisms. A decreased DC incidence and good oral hygiene can be ensured effectively through proper education and counseling of the patients for discontinuation of habits. Dental surgeons can play an important role in individual and population-based PS

Table 7: Association of caries pattern with gender and oral hygiene index

Gender	OHI	Grade of DMFT			Total	*P*
		No caries, *n* (%)	Moderate caries, *n* (%)	Severe caries, *n* (%)		
Male	Good	6 (85.71)	1 (14.29)	0	7	0.001
	Fair	34 (50.00)	19 (27.94)	15 (22.06)	68	
	Poor	12 (13.64)	37 (42.05)	39 (44.32)	88	
	Total	52 (31.90)	57 (34.97)	54 (33.13)	163	
Female	Good	2 (66.67)	1 (33.33)	0	3	0.020
	Fair	26 (48.15)	15 (27.78)	13 (24.07)	54	
	Poor	10 (20.00)	17 (34.00)	23 (46.00)	50	
	Total	38 (35.51)	33 (30.84)	36 (33.64)	107	

OHI=Oral hygiene index; DMFT=Decayed, missing, and filled teeth

abuse interventions to limit the negative influence on oral health. A longitudinal study with regular follow-up needs to be planned for more accurate results.

Limitation of study

The oral hygiene measures as well as the method for cleaning of the oral cavity were not recorded in the present study. Reasons for missing teeth were also not recorded. Proximal caries was not confirmed with radiographs. DC being multifactorial an association between a single positive factor such as tobacco abuse and caries incidence is difficult to conclude.

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Conflicts of interest

There are no conflicts of interest.

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