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Association of Tobacco Smoking with Periodontal Health and Early Loss of Teeth among Adult Population in Visakhapatnam

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Abstract

Background: Tobacco use is a major modifiable risk factor for health which was found to affect dental health by accelerating the onset, severity, and progression of periodontal disease.

Aim and Objectives: To assess the association of tobacco smoking with periodontal health and early loss of teeth among adult population of Visakhapatnam

Material and Methods: Data was collected using a face to face interview of a validated fagerstorm questionnaire and Periodontal status from WHO oral health assessment form 2013 to assess the periodontal status of the participants.Based on Purposive sampling technique and the desired sample size was 430 was obtained.

Results: Out of 430 participants, 244 (56.7%) were males and 186 (43.3%) were females. A population of 244 (187males and 57 females) members smoke their first cigarette within 5 mins of waking up, whereas 186 (129 males and 57 females' members smoke their first cigarette within 6 to 30 minutes after waking up in the morning. 187 (29.8%) males and 58 (13.5%) females smoke 21 to 30 cigarettes per day. There is a significant change in the loss of attachment based on the scoring criteria the pocket depth is seen upto 4-5 MM in majority of the participants (1.21±0.17). Most of the tobacco users (73,44.5%) had chronic periodontitis with periodontal pocket of 4-5 mm and attachment loss of 6-8 mm (79,48.2%) followed by periodontal pocket of 6-8 mm (31,18.9%) and clinical attachment loss of 4-5 mm (28,17.1%).

Conclusion: The results of the current study demonstrated that smoking negatively affects periodontal and gingival health. Preventing smoking will improve the oral and overall health related quality of life.

Keywords: Tobacco Smoking; Periodontal Disease; Smokers.

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INTRODUCTION

Tobacco is in charge of the newest plague of the twentieth century, and its utilization is still expanding around the world. Out of 930 million Worldwide tobacco users, 182 million smokers abides in India. World Health Organization (WHO) appraisal evaluated that by 2020, tobacco related demise may surpass 1.5 million every year or 13% of all passing in India.[1] Nicotine dependence includes parts of both mental and physical dependence. Tobacco use is a major modifiable risk factor for health, which is one of the leading causes of a range

of cardiovascular and respiratory disorders in addition to various cancers in the body.[1]

Smoking cigarettes can have numerous unfriendly consequences on oral and dental wellbeing. Smokeless tobacco is known to cause tumors of the mouth, lip, tongue, and pancreas along with majority leading to destruction of gum tissue, causing periodontal malady.[1]

Pindborg (1947) was one of the primary specialists to examine the connection between tobacco use and periodontal disease.[1] Furthermore, smoking was found to affect dental health by accelerating the onset, severity, and progression of periodontal disease, contributed by the development of a favorable milieu for periodontal pathogens inside the oral cavity.[2] Tooth loss impairs the quality of life, often substantially and affects the well-being of the person. Missing teeth can interfere with chewing ability, diction, and esthetics. Low self-esteem related to tooth loss can hinder an individual's ability to socialize, hamper the performance of work and daily activities.[3] The major factors that persist to encourage people to use smokeless form of tobacco are its low price, ease of purchase, and the widely held misconception of purported medicinal value in curing toothache, headache, and in decreasing hunger.[4] It has been demonstrated that tobacco smoking can result in an increased loss of periodontal attachment as well as alveolar bone. It has also been shown that outcomes of periodontal therapy are less favourable in smokers than in non-smokers.[5] The loss of many teeth often reduces the quality of life; embarrassment and self-consciousness limit social interaction and communication.[6] Because of chewing problems and decreased masticatory function, a limitation in food selection may occur, resulting in nutritionally poor diets. Poor nutrition might contribute to an increased risk of several systemic diseases such as cardiovascular diseases and hypertension. Tooth loss may be a significant problem related to general health and the quality of life.[6] About 2.3% of the global population representing 158 million people worldwide was edentate in 2010. Between 1990 and 2010, the global age standardized prevalence of severe tooth loss in the entire population decreased from 4.4% to 2.4%, a 45% decrease.[6] The global age-standardized incidence rate of severe tooth loss in 2010 was 205 cases per 100,000 persons year. A significant decrease (45%) from the 1990 incidence rate of 374 cases per 100,000 persons years.[6]

However, in India, very few studies have been there evaluating the association of tobacco smoking with periodontal health and early loss of teeth in adult population.[6] The habit of tobacco use which was prevalent in approximately one-third of the adult population worldwide occurs either in the form of smokeless tobacco. In addition to the chronic diseases mentioned earlier, tobacco related habits have also been identified as major behavioural risk factors for a variety of oral heath related conditions, such as periodontal diseases and tooth loss.[7]

However, tooth loss was not only a disease related problem, as it could also be considered as a condition associated with socioeconomic status. It was well documented in various studies that smoking increases the risk for tooth loss among the middle aged and older population.[7]

The men who smoke cigars were at high risk of having alveolar bone loss, and persons who smoke cigars or pipes had higher number of missing teeth than non-smokers.[8]

The people in South Asian consumes tobacco in various forms and in North India (beedis are products used commonly (tobacco wrapped in the dried leaves (Bauhinia racemose) of for cigarettes for smoking.[9]

Hence the present study will be conducting to assess the association of tobacco with periodontal health and early loss of teeth among adult population in Visakhapatnam.

AIM

To assess the association of tobacco smoking with periodontal health and early loss of teeth among adult population of Visakhapatnam.

OBJECTIVES

1. To assess the prevalence of tobacco smoking among adult population of Visakhapatnam using The Fagerstrom test for nicotine Dependence smokeless tobacco (FTND-ST).
2. To assess the periodontal health status of the tobacco smokers among the adult population of Visakhapatnam using CPI index.
3. To assess the prevalence of early loss of teeth in the tobacco smokers among the adult population of Visakhapatnam using 2013 WHO proforma.
4. To find association between tobacco smoking, periodontal health status and early loss of teeth among the adult population of Visakhapatnam.

METHODOLOGY

A descriptive cross-sectional study was carried out from June 2022 to November 2022 to assess the association of tobacco with periodontal health and early loss of teeth among adult population in Visakhapatnam." using WHO oral health assessment form 2013 and self-administered, pretested, validated fager storm questionnaire.

STUDY SETTING

Community dental outreach programmes conducted by Dental institute in Visakhapatnam district, Andhra Pradesh, India.

Study Population

The survey was carried out among 35-44 years old tobacco smoking people attending community dental outreach programs conducted by Dental institute in Visakhapatnam District. This age group was focused on as it is the WHO recommended standard monitoring group for oral health conditions of adults.

Study Design

A Descriptive cross-sectional study was conducted the association of tobacco with periodontal health and early loss of teeth among adult population in Visakhapatnam. 35–44 year-old adults attending outreach programs in Visakhapatnam" using WHO oral health assessment form 2013 and self-administered, pretested, validated questionnaire.

Training and Calibration of Examiner

The clinical examination of all the study participants was done by a single examiner with the help of a recorder. Prior to the study the examiner was trained to record the questionnaire and WHO criteria (2013) for adults in the department of Public Health Dentistry, Anil Neerukonda Institute of Dental Sciences.

Pilot Study

A pilot study was conducted prior to the main study among a convenience sample of 30, among 35-44 year-old adults attending community outreach programs conducted by dental institution, Visakhapatnam district in an endeavour to standardize the methodology with diagnostic instruments, criteria and data recording procedure. The prevalence of periodontal status obtained was 78.5%.

Sample Size

Sample size determination was based on the periodontal status prevalence obtained from pilot study (70%).

Formula used for estimation of sample size is:

$$\text{Sample size} = \frac{z^2pq}{L^2} = \frac{4pq}{L^2}$$

p = prevalence 78.5% (78.5/100=0.78)

q = 1- p = 0.78)

L = allowable error 0.04

z = 1.96 ~ 2 for 95% confidence interval for descriptive study.

$$\text{Sample size} = \frac{4\times0.78\times 0.22}{0.04\times0.04} = 429.$$

The estimated sample size was 429 based on the prevalence rate of 78.5%.

After substitution of values the sample size arrived at 429 which was rounded off to 430.

Sampling Method

Approximately 40 outreach programs had been conducted from which smokers who were in between the age group of 35-44 year old were selected by using Purposive sampling method.

Inclusion Criteria

1. The participants attending the outreach programs on that day will be included in the study.
2. The participants who gives the informed consent will be included in the study.

Exclusion Criteria

1. Uncooperative participants were excluded from the study.
2. The participants who attend the outreach programs and would not give informed written consent had been excluded in the study.

Ethical Clearance

The protocol for the study was submitted before Institutional ethics committee and request for ethical clearance was made. The ethical clearance was obtained on 18-01-2021 with reference number ANIDS/IEC/2021015.

Obtaining Permission from Participants

The study procedure was explained to the participants in local language and signed consent form was obtained.

Data Collection

1. Fagerstorm Questionnaire
2. WHO Oral health assessment form 2013 (Adults)

Questionnaire

A Pretested, validated, self-administered questionnaire was given to the 35-44 year-old smoking adults who attended community outreach programs

Examiner Position and Examination

The examinations were carried out in a well - illuminated day light by a trained and calibrated examiner with the help of a recorder. Type III Dental examination of the study participants was carried out under natural light. The subjects were examined by making them sit on a chair, with his or her neck extended, and the examiner standing opposite to them. The study was conducted in two phases. First a self-administered, pre-tested questionnaire was distributed among the 35-44 year old adults who had smoking habits, attending the community outreach programs in Visakhapatnam district in both English and Telugu to assess the association of tobacco smoking with periodontal health and early loss of teeth among adult population of Visakhapatnam. Second, they were examined orally using WHO criteria 2013. The examiner was accompanied by a trained assistant for recording the questionnaire and proforma.

Procedure

A self-administered, pre-tested questionnaire was distributed among 35-44 years old adults attending community outreach programs in Visakhapatnam district in both English and Telugu to assess the association of tobacco smoking with periodontal health and early loss of teeth among adult population of Visakhapatnam. Outreach programs had been conducted in Visakhapatnam districts.

The clinical examination of each study participant was done at community outreach programs

Oral health education was provided to the participants attending outreach programs after completion of examination.

STATISTICAL ANALYSIS

- The data collected was entered in Microsoft Excel Software by the examiner. The entered data were exported to SPSS (Statistical package for social science) for statistical analysis.
- Statistical tests were done using SPSS 25.0
- The level of significance was set at $p< 0.05$.

Table 1: Gender wise distribution details

Gender	N (%)
Males	244 (56.7%)
Females	18 6(43.3%)

Table 1: Depicts the distribution based on gender of participants who were smokers in which majority of them were males 244 (56.7%) and 186 (43.3%) were females.

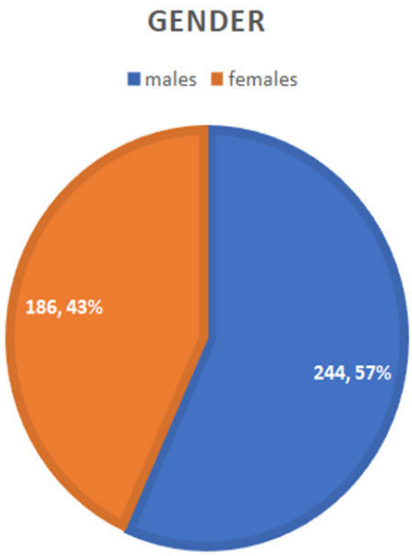
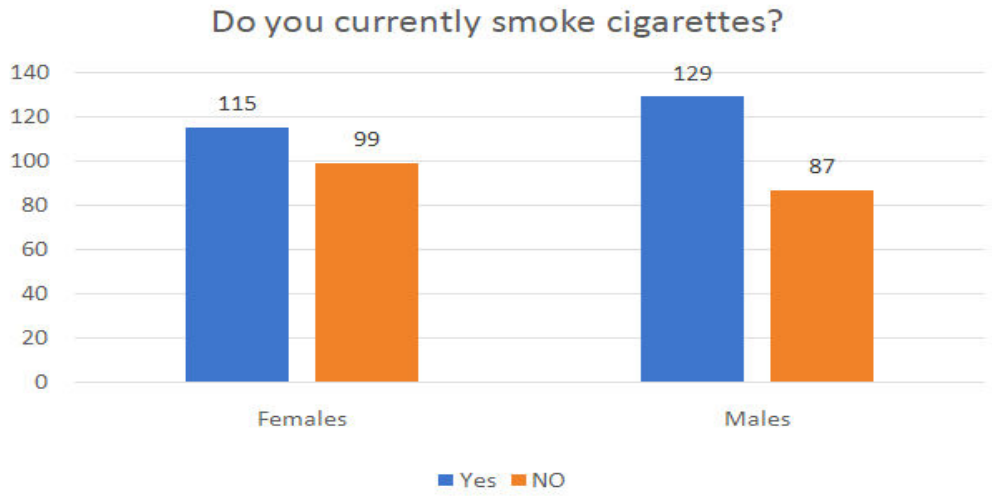


Fig. 1: Gender

Table 2: Fagerstorm questionnaire

Questions	Option	Females N (%)	Males N (%)	Chi square	p-value
Do you currently smoke cigarettes?	Yes	115 (26.7%)	129 (30.0%)	1.568	0.210
	No	99 (23.0%)	87 (20.2%)		
How soon after you wake up do you smoke your first cigarette?	Within 5 mins	57 (13.3%)	187 (43.5%)	2.875	0.090
	6-30 mins	57 (13.3%)	129 (30.0%)		
	31-60 mins	–	–		
	After 60 minutes	–	–		
Do you find it difficult to refrain from smoking in places where it is forbidden (e.g., in church, at the library, in the cinema)?	No	187 (43.5%)	57 (13.3%)	2.875	0.90
	Yes	129 (30.0%)	57 (13.3%)		
Which cigarette would you hate most to give up?	The first one in the morning	72 (16.7%)	172 (40.0%)	11.375	0.001*
	Any other	29 (6.7%)	157 (36.5%)		
How many cigarettes per day do you smoke?	10 or less	57 (13.3%)	187 (43.5%)	3.296	0.69
	21 to 30	58 (13.5%)	128 (29.8%)		
	11 to 20	–	–		
	31 or more	–	–		
Do you smoke more frequently during the first hours after waking than during the rest of the day?	No	63 (14.7%)	123 (28.6%)	.475	0.490
	Yes	75 (17.4%)	169 (39.3%)		
Do you smoke when you are so ill that you are in bed most of the day?	No	181 (42.1%)	63 (14.7%)	.746	0.388
	Yes	131 (30.5%)	55 (12.8%)		

Table 2 shows the response of the participants for the fagerstorm questionnaire depending on the gender, majority of the male patients 129 (30.0%) currently smoke cigarette among them 187 (43.5%) participants smokes their first cigarette Within 5 minutes after waking up in the morning. 172 (40.0%) of male participants and 72 (16.7%) female patients hate to give up the first one in the morning.



Graph 1: Shows the no.of participants who currently smoke cigarettes.

Table 3: Correlation Between Age and Loss of Attachment for the Index Teeth.

Loss of Attachment		**16/17**	**11**	**26/27**	**36/37**	**31**	**47/46**
	N	430	430	430	430	430	430
Age (35-44 Years)	Pearson Correlation	0.23	.338**	.628**	.577**	.380**	.560**
	Significance	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*

Table 3 Shows that there is a positive correlation between age and loss of attachment with a statistical significant difference.

Table 4: Mean Values of Bleeding on Probing and Periodontal Pockets

	N	**Mean ±S.d**	**St. error**	**T value**	**P-value**
Pocket	430	1.31±0.25	0.012	108.448	**0.000***
Bleeding	430	1.7±0.20	.010	170.16	**0.000***

P<0.05* is significant, p<0.001- highly significant

Table 4: Shows the mean value of Bleeding on probing **(**1.7±0.20) and pocket depth (1.31±0.25), which were found to be statistically significant.

Table 5: Shows The Mean and Standard Deviation of Scoring Criteria of Loss of Attachment

Loss of attachment	**N**	**Mean ±S.D**	**St. error**	**P-value**
Score 1 (0-3mm)	124	1.39±0.21	0.019	**0.000***
Score 2 (4-5mm)	290	1.21±0.17	0.009	**0.000***
Score 9 (sextant excluded)	15	**2.11±0.008**	**0.002**	**0.000***

P<0.05* is significant, p<0.001- highly significant

Table 5: shows Among the population of 430, HIGHEST score is seen among 290 participants with score 2 (4-5MM) of pocket depth, followed by score 1 among 124 population (0-3MM)

Table 6: Shows The Mean Values of Scoring Criteria of Bleeding on Probing

Bleeding	**N**	**Mean ±St. Deviation**	**St. error**	**P-value**
Absence	120	1.62±0.11	0.010	**0.000***
Presence	310	1.66±0.19	0.011	**0.000***

P<0.05* is significant, p<0.001-highly significant

Table 7: Correlation Between Fagerstorm Nicotine Dependence and Periodontal Pocket

Spearman's Correlation coefficient	**N**	**Fagerstorm nicotine dependence**	**Periodontal Pocket**	**P-value**
Smoking	430	1.000	0.096	**0.04***
Periodontal pocket	430	0.096	1.000	

P<0.05* is significant, p<0.001-highly significant

Table 7 shows the positive correlation between tobacco smoking and Periodontal Pockets, which was statistically significant

DISCUSSION

Smoking is the primary cause of many oral problems, including periodontal disease. Tobacco is consumed by smokers to regulate arousal levels and to manage their mood. It also enhances focus and performance on several tasks. One of the components of tobacco that leads to addiction is nicotine. Because it makes people feel good, the addictive drug nicotine also helps people feel less stressed and anxious. When nicotine is absorbed by cigarette smoke, it enters the bloodstream quickly through the lungs and travels to the brain in a matter of seconds.[10]

There are a number of risk factors that contribute to an increased prevalence of periodontitis, including tobacco use, education and socioeconomic position, diabetes mellitus, access to health care, and oral hygiene practises.[15] Smoking, stress, and obesity are examples of risk factors that are known to enhance the susceptibility to periodontal disease and are therefore thought of as modifiable variables according Ainamo et al.[11,12]

In a wide range of populations, there is a clear link between tobacco use and smoking practices and periodontal diseases.[13] Recent research has definitely established a link between smoking exposure and both the prevalence and seriousness of periodontal disease.[14] For a good diagnosis, smoking is a necessary component, and in clinical practise, direct measurement of smoking history is of utmost significance. However, it is unknown, how smoking affects the stages of periodontitis.[15] The Fagerstorm Questionnaire is a helpful tool for determining who has the highest consumption of tobacco products and may consequently be more susceptible to disease.[16]

A study conducted by p. Axelsson, J. and J. Lindhe suggested that there was a relationship between loss of periodontal attachment and the duration of smoking among the subjects.[17]

This present study is to know the correlation between smoking and periodontitis stage So, the present descriptive cross-sectional study was planned to know the association of tobacco smoking with periodontal health and early loss of teeth among adult population in Visakhapatnam which had been conducted based on the WHO survey age group i.e; 35-44 years, where the smoker's status had been recorded by using Fagerstorm Questionnaire (FTND).

In the present study the participants were selected based on purposive sampling who are attending the dental outreach programs conducted by the dental institution and the total sample obtained was 430 out of which 244 (56.7%) were males and 186(43.3%) were females, this is similar in line conducted by Ojima et al and Shabana Begum SK et al that men (53.3%, 64.29%) had a significantly higher smoking rate than women (15.5%).[6,3]

This study shows that majority of the participants currently smoke cigarettes (129 males and 115 females). A population of 244 (187 males and 57 females) members smoke their first cigarette within 5 mins of waking up, whereas 186 (129 males and 57 females' members smoke their first cigarette within 6 to 30 minutes after waking up in the morning. Similarly, study was done by Dahal et al showed that majority of the participants consumed tobacco were males (79%) when compared to females (6%).[10]

In the present study, 186 (57 males and 129 females) Participants found difficult to refrain from smoking in places where it is forbidden (e.g., in church, at the library, in the cinema), where majority of them 244(57 males and 187 females) can refrain from smoking in places where it is forbidden.

Among total population 172 (40.0%) males and 72 (16.7%) females participants hate most to give up the first cigarette in the morning when compared to the cigarettes that are smoked in the rest of the day, 157 (36.5%) males and 29 (6.7%) females.

In the present study 187 (43.5%) males and 57 (13.3%) females participants smoke 10 or less cigarettes, whereas 187 (29.8%) males and 58 (13.5%) females smoke 21 to 30 cigarettes per day.

Among 430 participants majority of the participants smoke frequently during the first hours after waking than during the rest of the day i.e; 169 (39.3%) males and 75 (17.4%) females, this might be due to (urgency of restoring the level of cigarette nicotine after abstinence during sleeping) and maintaining the level of nicotine during waking.[18,19]

This present study showed that there is a correlation between age and loss of attachment as the age increases the loss of attachment also increases though smoking is the risk factor in this study it showed a positive correlation between age and attachment loss. This is in concordance with study conducted by Syeda et al. shows the prevalence of periodontal disease is higher in older people, which is another factor contributing to its rise. This might be due to the relationship between age and periodontal disease as to people in their 40s and 50s has less attachment loss, where it is more apparently seen among those aged 60 to 90.[20] Though the sample size was 35-44 year

old in addition to the smoking as a risk factor the loss of attachment showed the significant change. The World Health Organization advises that risk factors for periodontal disease include stress, socioeconomic status, and smoking.

This present study shows the mean values of bleeding on probing (1.7±0.20) and periodontal pockets (1.31±0.25,) where there is decrease in bleeding on probing which is similar to the study conducted by Velidandla et al which found that smokers had less bleeding on provocation when compared to non-smokers, it might be due to usage of nicotine, which causes vasoconstriction of peripheral blood vessels such as in the forearm, skin and hands,[21] which is also similar to the studies conducted by Rajkarnikar and Acharya's hospital based study revealed that the majority of tobacco users smokers (84.5%), chewers (100%) and dual users (86.4%) had increased periodontal deterioration.[22]

According to a study by Pradhan et al. conducted on a rural Nepali population, both light and heavy smokers have deeper periodontal pockets than non smokers.[23]

According to the present study showing the significant changes in the loss of attachment based on the scoring criteria the pocket depth is seen up to 4-5 mm in majority of the participants (1.21±0.17) which is similar to the studies conducted by Dahal et al showed that most of the tobacco users (73, 44.5%) had chronic periodontitis with periodontal pocket of 4-5 mm and attachment loss of 6-8 mm (79, 48.2%) followed by periodontal pocket of 6-8 mm (31, 18.9%) and clinical attachment loss of 4-5 mm (28, 17.1%). Very few (24, 14.6%) tobacco users had healthy periodontium.[10] It has been show by epidemiological studies that smoking has a marked influence on prevalence, extent, and severity of periodontitis Holm et al.[24] Other investigations have demonstrated that smokers experience higher levels of some clinical measures than non-smokers, including probing pocket depth and clinical attachment loss. It's important to note that smokers exhibit less bleeding during probing and less inflammation when plaque builds up compared to non-smokers.[25,26]

This study shows that the number of teeth lost by participants with high dependency (8+) scores was largest 147 (71%), while the number of teeth lost by people with low to moderate dependence was lower 19 (52.8%), which is similar to the study conducted by. K Tanaka et al,[27] A prospective research of Swedish women aged 38 to 60 found a substantial positive correlation between daily cigarette consumption and the number of teeth lost over a 12-year follow-up period. Additionally, a cross-sectional study conducted in the US found that the mean number of missing teeth among current, former, and non-smokers was 5.1, 3.9, and 2.8, respectively. The prevalence of tooth loss among Japanese men aged 20 to 59 years was significantly positively linked with active smoking for more than 10 years or ingesting at least 11 cigarettes daily compared to non-smokers.[28] It is important to perform numerous studies, such as the National Oral Health Survey, to better understand the connections between the risk factors for periodontal diseases. The strengths of this study were Health education and tobacco cessation counselling was given for all the participants. Integrating two different types of data collecting instruments in this study, makes the research more purposeful. After screening of the patients in dental outreach programs the participants who are in need of treatment were referred to our institution and treatments were done. The present study was limited by cross-sectional design which reports the presence or absence of conditions at that particular time. This study was conducted on lesser population so that Generalizability cannot be done. This study can lead to social desirability bias.

CONCLUSION

Smoking is the primary cause of many oral problems, including periodontal disease. It has been demonstrated that tobacco smoking can result in an increased loss of periodontal attachment as well as alveolar bone. In the present study the participants were selected based on purposive sampling who are attending the dental outreach programs conducted by the dental institution and the total sample obtained was 430 out of which 244 (56.7%) were males and 186 (43.3%) were females. The results of the current study demonstrated that smoking negatively affects periodontal and gingival health. Smoking is highly linked to chronic periodontitis, and the relationship is dosage dependant manner. Health education, tobacco cessation, and motivating initiatives should be prioritised at the national and international levels in order to prevent and control tobacco induced oral illnesses. As a result, public awareness campaigns should be developed to educate the general population in order to discourage such behaviours. It is critical to create preventive interventions to limit tobacco consumption. Preventive interventions,

particularly those aimed at the adult population, must be implemented on an emergency basis. This is especially crucial for emerging countries like India, which have become the primary targets of international tobacco companies' advertising and promotional propaganda. Preventing smoking will improve the oral and overall health related quality of life.

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