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ASSOCIATION OF TOBACCO SMOKING WITH PERIODONTAL HEALTH AND EARLY LOSS OF TEETH IN ADULT POPULATION OF MODINAGAR

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ABSTRACT

Introduction: According to WHO estimates, tobacco use is a leading cause of unnecessary deaths in India, which would account for 13% of all fatalities by 2020 and exceed 1.5 million deaths yearly. Ironically, tobacco is the only legal substance that, when taken exactly as prescribed by makers, kills a large number of consumers. Smoking is one of the harmful addictive behaviors that can negatively impact periodontal health and ultimately lead to tooth loss.

Methodology: To assess the relationship between tobacco, use and periodontal health and early tooth loss in an adult Modinagar community, a descriptive cross-sectional epidemiological survey was carried out. There were 400 smokers, and 400 non-smokers aged 35 to 44 in the study. The relationship between smoking and the highest CPI scores and missing teeth was examined using the independent t-test and the chi-square test. The relationship between the frequency and duration of smoking and missing teeth was examined using Pearson correlation. A P-value of 0.05 or less was regarded as statistically significant. The software program SPSS v21.0 was used to analyze all the data that was gathered.

Results: The Chi square test revealed that smoking was associated with the highest CPI score of 5.828 ($p = 0.001$) and missing teeth of 25.923 ($p = 0.001$).The independent t test value was 4.235 ($p = 0.001$) when comparing the mean values of missing teeth. The number of missing teeth was shown to be 0.448 ($p = 0.001$) correlated with smoking frequency and 0.351 ($p = 0.001$) correlated with smoking duration,

according to Pearson's correlation.
Conclusion: According to the findings, smokers in Modinagar city had a higher prevalence of periodontal disease and the ensuing tooth loss than non-smokers. As a result, this demographic has a greater need for tobacco cessation and oral health education.
Keywords: Oral Health, Periodontitis, Smoking, Tobacco, Tooth loss

INTRODUCTION

Originally brought to Europe during World War I, tobacco smoking is an addictive habit. Smoking has been called "a tragic accident of history" due to its widespread use throughout the world (Musk & Klerk, 2003). [1,2] Tobacco smoking prevalence seems to be rising in the WHO Eastern Mediterranean Region and the African Region, despite a global decline in smoking. [3]

The only legal substance that kills a large number of consumers when taken exactly as prescribed by makers is tobacco. According to the WHO, tobacco use—both smoking and non-smoking—causes over six million deaths globally each year. Approximately 600,000 of these deaths are caused by secondhand smoke. [WHO global report on tobacco smoking prevalence trends, 2015] [3] As a result, smoking is now acknowledged as one of the leading causes of avoidable illness and death. [1]

Smoking tobacco is a common risk factor for a number of chronic diseases because it contains a complex mixture of hazardous substances, such as carbon monoxide, different nitrosamines, and nicotine, the most pharmacologically active molecule. [1, 2, 4] According to the dental perspective, the most significant environmental risk factor that might negatively impact periodontal health is tobacco use, primarily in the form of cigarettes. [4,5] It is believed that smoking impairs the immune system and the capacity of periodontal tissue to recover after a period of disease activity. [5]

Chronic infection conditions known as periodontal diseases impact the dentition's supporting tissues. [1, 4, 6] Patients with periodontal disease frequently exhibit a vertical or horizontal pattern of bone loss, which ultimately results in early tooth loss. [2,7]

The World Health Organization (WHO) states that individuals should have at least 21 healthy teeth in order to be able to eat healthily without the need for dentures. It is possible for edentulous people to have limited dietary choices, which can lead to diets that are low in nutrients. According to Slade and Spencer (1994), edentulous people had more social and psychological effects on their quality of life than dentate people, such as feeling self-conscious and avoiding social situations.[8,9]

There is growing evidence that the prevalence of periodontal disease is higher in tobacco users than in non-users. [2,10] According to a 2005 study by Suzen Bakur Natto, smoking tobacco has a detrimental effect on periodontal health. [2] Smoking is a major risk factor for periodontal disease, according to a number of studies, including those by Axelsson et al. (1998), Tomar et al. (2000), Gautam et al. (2011), Basavaraj et al. (2014), and others, which revealed that non-smokers had better periodontal health than smokers. [5, 6, 11, 12] Numerous investigations, including those by Al-Shammari et al. (2005), Dietrich et al. (2.007), Ojima M et al. (2007), Mai X et al. (2013), and others, demonstrated a strong correlation between smoking and tooth loss. [7, 8, 13, 14] Additionally, a recent study by Qureshi FH et al. (2018) found that smokers were more susceptible to tooth loss. [15] Consequently, it is clear that smoking tobacco has a serious negative impact on one's health.

Despite the extensive body of research on the link between smoking and tooth loss and periodontal disease, most of the studies have been conducted in westernized countries where the types and forms of tobacco use differ from those in India. The current study was carried out to assess the relationship between tobacco use and periodontal health and early tooth loss in the adult population of Modinagar because of the substantial effects of smoking on these conditions in the Indian population.

METHODOLOGY

To determine the relationship between smoking, periodontal health, and related tooth loss in Modinagar city's adult population aged 35–44, a descriptive cross-sectional study was carried out. The dentistry college's Institutional Review Board granted ethical clearance, and all study participants provided written informed permission after being briefed in their native tongue about the study's goals and procedures.

Inclusion criteria:

1. Participants who smoke and are between the ages of 35 and 44 were included in the study.
2. Informed consent subjects were included.

Exclusion criteria:

1. Participants who engaged in non-smoking behaviors, such as pan chewing or drinking alcohol, were not included.
2. Excluded were subjects having systemic conditions such as congenital heart disease, diabetes, hypertension, epilepsy, asthma, or chronic kidney disease.

Pilot study: To determine the relationship between periodontal disease and tooth loss in smokers and non-smokers, a pilot study was conducted. The population participating in the outreach program run by the teaching dentistry college made up the sampling frame for the pilot project. According to the inclusion and exclusion criteria, the 25 participants in the outreach program who were between the ages of 35 and 44 on the day of the test were added to the study sample. These participants were excluded from the main study. The pilot study examined face and content validity in relation to the questionnaire's wording, substance, scoring system, and suitability and ease of administration.

The smoking prevalence among those aged 35–44 was found to be roughly 51%. The sample size for both smokers and non-smokers was calculated to be 399.84, rounded off to 400, with a 95% confidence level and a 5% allowed error.

Sample size estimation:

399.84 was determined to be the sample size for smokers and non-smokers based on the findings of the pilot study. As a result, the sample size was rounded to 400 subjects for both smokers and non-smokers.

Scheduling of the Survey:

The study, which involved adults aged 35 - 44 in Modinagar, India, was planned to take place across three months, from the first week of January to the first week of April 2019. Based on the pilot study, it was determined that each subject's interview and clinical examination took an average of 10–12 minutes. As a result, the weekly and daily schedules were created. On average, 15 - 20 persons were checked in a single day. Three days a week were dedicated to the examination.

Data Collection:

Data was gathered by conducting a house-to-house survey in each of Modinagar's 4 zones. The data for this study was gathered using a structured pretested performance in the local language, Hindi.

Three sets of information were included in the data collection:

1. Evaluation of the study participants' socio demographic data, dental hygiene habits, and smoking status using the protocols outlined in the WHO Basic Oral Health Survey 2013 performa.
   2.The use of the CPITN index to evaluate periodontal health.
   3. Evaluation of research participants' tooth loss.

The examiner classified each missing tooth based on its cause after identifying the participants who

had at least one missing teeth. Those who reported losing at least one tooth due to periodontal disease were considered to have tooth loss due to periodontal disease for the purposes of these analyses. Participants were excluded from the study and categorized as not having tooth loss in general if they had lost at least one tooth as a result of caries or any other cause outside periodontal disease.

Statistical Analysis:

The Microsoft Word Excel Sheet 2007 version was used to enter all of the obtained data, and SPSS v21.0 was used for analysis. The study employed descriptive statistics, including mean, standard deviation, frequency, and percentage. The relationship between smoking and both the highest CPI scores and missing teeth was examined using the Independent t-test. The relationship between the frequency and duration of smoking and missing teeth was examined using Pearson correlation. Statistical significance was defined as any p-value below 0.05.

RESULTS

This study recruited 800 participants (400 smokers and 400 non-smokers) to determine the relationship between smoking, periodontal health, and related tooth loss in Modinagar city's adult population aged 35 to 44.

The age group of 35–39 years old had the highest percentage of smokers (67.8%), whereas the age group of 40–44 years old had the highest percentage of non-smokers (63.8%).There were 63.2% unskilled workers, 23.2% jobless, 4.8% skilled workers, 4% clerks, 3% professionals, and 1.8% semi-professionals in the smoker's group. Of those who did not smoke, 34.8% were unskilled workers, 20.2% were skilled workers, 14.5% were unemployed, 12.8% were clerks, 10% were semi-professionals, and 7.8% were professionals.

In terms of oral hygiene, the majority of our study participants 42.2% of smokers and 235 non-smokers—used toothpaste and toothbrushes. Additionally, the majority of smokers (76.5%) and non-smokers (59%) brushed just once a day. Just 10.5% of smokers and 50.2% of non-smokers experienced bleeding gums, although 51.5% of smokers and 27.2% of non-smokers who took part in the study reported having a history of systemic disorders. Table 1 provides demographic information on the study participants, including smokers and non-smokers.

The majority (82.2%) used beedi, 13.5% used cigarettes, and the remaining 17 (4.2%) utilized hookahs to smoke. Among the 400 smokers, 60% smoke 6-10 cigarettes per day, 113 28.2% smoke 11-15 cigarettes per day, 6% smoke more than 15 cigarettes per day, and the remaining 5.8% smoke 1-5 cigarettes per day. In terms of smoking history, 67.5% smoked for the previous 1-10 years, 17.5% for less than a year, 10.2% for the previous 11-20 years, and the remaining 4.8% for more than 20 years. [Table 2.]

The results revealed that 238 (59.5%) smokers and 166 (41.5%) nonsmokers had at least one missing tooth, while the remaining 162 (40.5%) smokers and 234 (58.5%) nonsmokers had no missing teeth. Among the 800 subjects, nobody (0%) had a healthy periodontium (Score 0), while 0 (0%) smokers and 55 (13.8%) non-smokers had bleeding on probing (Score 1), 18 (4.5%) smokers and 290 (72.5%) non-smokers had severe supra or subgingival calculus deposition (Score 2), 68 (17%) smokers and 44 (11%) non-smokers had a pocket depth of 4-5 mm (Score 3), and 314 (78.5%) smokers and 11 (2.7%) non-smokers had a pocket depth of 6 mm or more (Score 4).

There was a statistically significant difference ($p = 0.001$) between the mean number of missing teeth among smokers (1.58 + 1.889) and nonsmokers (1.06 + 1.588).The independent t-test revealed a statistically significant difference in mean sextant CPI scores between smokers and non-smokers ($p < 0.05$).[Table 3.] In our study, the connection of many missing teeth with smoking frequency was 0.448,

and the correlation with smoking duration was 0.351, both of which were statistically significant (p = 0.001). [Table 4.]

Table 1: Demographic data of Smokers and Non-smokers

DEMOGRAPHIC DATA		SMOKERS		NON-SMOKERS	
		Number	Percentage	Number	Percentage
AGE	35-39 years	271	67.8%	145	36.2%
	40-44 years	129	32.2%	255	63.8%
EDUCATIONAL STATUS	Illiterate	101	25.5%	51	12.8%
	Primary school	117	29.2%	76	19%
	Middle school	106	26.5%	38	9.5%
	High school	23	5.8%	32	8%
	Intermediate or Diploma	19	4.8%	81	20.2%
	Graduate	22	5.5%	91	22.8%
	Profession or Honours	12	3%	31	7.8%
OCCUPATION	Unemployed	93	23.2%	58	14.5%
	Unskilled	253	63.2%	139	34.8%
	Skilled	19	4.8%	81	20.2%
	Clerical	16	4%	51	12.8%
	Semi-professional	7	1.8%	40	10%
	Professional	12	3%	31	7.8%
ORAL HYGIENE METHOD	Tooth brush and Tooth paste	169	42.2%	235	58.8%
	Tooth powder and Finger	68	17%	126	31.5%
	Finger	139	34.8%	22	5.5%
	Stick	24	6%	17	4.2%
FREQUECY OF TOOTH BRUSHING	Once	306	76.5%	236	59%
	Twice	42	10.5%	110	27.5%
	After each meal	8	2%	26	6.5%
	Sometimes	44	11%	28	7%
DURATION OF TOOTH BRUSHING	1 min	173	43.2%	184	46%
	2 min	176	44%	144	36%
	3 min	51	12.8%	72	18%
TYPES OF MOVEMENTS EMPLOYED FOR TOOTH BRUSHING	Horizontal	277	69.2%	238	59.5%
	Vertical	70	17.5%	80	20%
	Circular	53	13.2%	82	20.5%
MOUTH WASH USAGE	Yes	76	19%	108	27%
	No	324	81%	292	73%
INTERDENTAL AIDS USED	Dental floss	13	3.2%	19	4.8%
	Inter-dental brushes	6	1.5%	17	4.2%
	Toothpicks	48	12%	86	21.5%
	None	333	83.2%	278	69.5%
	Yes	42	10.5%	201	50.2%

PRESENCE OF BLEEDING GUMS	No	358	89.5%	199	49.8%
PRESENCE OF SYSTEMIC DISEASES	Yes	206	51.5%	109	27.2%
	No	194	48.5%	291	72.8%

Table 2: Smoking characteristics of study subjects

SMOKING CHARACTERISTICS		NUMBER	PERCENTAGE
TYPE OF SMOKING	Cigarettes	54	13.5%
	Beedi	329	82.2%
	Hookah	17	4.2%
	Others	0	0%
FREQUENCY AND AMOUNT OF SMOKING	1-5 Cigarettes per day	23	5.8%
	6-10 Cigarettes per day	240	60%
	11-15 Cigarettes per day	113	28.2%
	More than 15 Cigarettes per day	24	6%
DURATION OF SMOKING	Less than 1 year	70	17.5%
	For past 1 - 10 years	270	67.5%
	For past 11 - 20 years	41	10.2%
	More than 20 years	19	4.8%

Table 3: Comparison of mean of Missing teeth and sextants with Different CPI Scores among Smokers and Non-smokers (Independent t – test)

PERIODONTAL STATUS		SMOKERS	NON-SMOKERS	T VALUE	P VALUE
MEAN NUMBER OF MISSING TEETH		1.58 ± 1.889	1.06 ± 1.588	4.235	0.001**
	SCORE 1	0.23 ± 0.935	3.54 ± 1.775	-32.943	0.001**
	SCORE 2	2.53 ± 1.668	1.84 ± 1.375	6.338	0.001**
	SCORE 3	1.99 ± 1.730	0.51 ± 1.369	13.417	0.001**
	SCORE 4	1.24 ± 1.013	0.11 ± 0.666	18.680	0.001**

** Significant ($p \leq 0.05$)

Table 4: Correlation between Frequency and Duration of Tobacco Smoking with Number of Missing teeth (Pearson correlation)

	NUMBER OF MISSING TEETH

	PEARSON CORRELATION VALUE	P VALUE
FREQUENCY OF SMOKING	0.448	0.001**
DURATION OF SMOKING	0.351	0.001**

** Significant ($p \leq 0.05$)

DISCUSSION

Tobacco smoking, which kills nearly 6 million people each year, is one of the primary causes of morbidity and mortality because it is a major risk factor for a variety of health disorders, including chronic diseases such as pulmonary and oral malignancies. [15, 16] The most common causes of adult tooth loss are periodontitis and dental caries. [15, 17, 18] Since the 1990s, there has been a significant surge in epidemiological studies investigating the link between smoking and periodontal disease. [19] The quantity and duration of tobacco consumption contribute to the association between tobacco smoking and periodontal disease. [20] Because smoking has such a major impact on periodontal health, the current study sought to elucidate the relationship between tobacco smoking and periodontal health and early tooth loss in Modinagar's adult population.

The study involved 800 participants: 400 smokers and 400 nonsmokers. The statistics found that 67.8% of smokers were between the ages of 35 and 39, while 63.8% of nonsmokers were between the ages of 40 to 44. According to a study conducted by Gautam et al., 48% of cigarette smokers were between the ages of 35 and 44, whereas 63% of non-smokers were aged 45 to 55. [5] Reduced smoking rates among the elderly reflect higher stopping activities. Tobacco-related death and sickness among smokers are key factors contributing to the decline in smoking rates among the elderly. [21]

Most smokers in this study had a very low educational level, whereas the majority of non-smokers had at least a diploma level education. The findings are comparable to those of Tomar S L et al, who found that only 18.7% of smokers had schooling beyond the higher secondary level. [11] In this study, 63.2% of smokers were unskilled workers, while only 3% were professionals, which is consistent with the findings of Wang Q et al, who found that only 14.69% of smokers were professionals. [22] According to a study by Mccurdy SA et al, 35.4% of male smokers and 33.6% of female smokers are professionals. [23] Occupation and money may have independent effects on smoking. Psychologically, most people smoke to cope with stress caused by socioeconomic and vocational circumstances. [24]

In this study, 42.2% of smokers and 58.8% of nonsmokers used a toothbrush and toothpaste. These findings are consistent with a study conducted by Basavaraj P et al., in which 54.5% smokers and 75% nonsmokers utilized the same oral hygiene tool. [6]In this study, 76.5% of smokers and 59% of nonsmokers brushed their teeth once a day.According to a study conducted by VellappallyS et al, 87.8% of current smokers wash their teeth once each day. [25]

In our study, bleeding gums were reported by 50.2% of nonsmokers and 10.5% of smokers. These findings are consistent with a study conducted by Al-Habashneh et al, which found that 27.4% of smokers and 72.6% of nonsmokers had bleeding gums. [26] The study by Al-Qurashi H et al. also finds agreement among nonsmokers (51.4%) but not among smokers (43.8%). [27] Nicotine in cigarettes acts as a vasoconstrictor, which is why smokers have fewer bleeding gums than nonsmokers. [28] Our study found that 51.5% of smokers and 27.2% of non-smokers had systemic illnesses, which supports the review of VellappallyS et al. [29]

82.2% of smokers in this survey used beedi, 13.5% used cigarettes, and only 4.2% utilized hookah. The findings contradict Katuri KK et al's study, which found that 95% of respondents used cigarettes and only 2.5% used beedi. [30] The contrast results could be attributable to variances in product availability in each locale. In the current study, 60% of smokers smoked 6-10 cigarettes per day,

whereas 28.2% smoked 11-15. The findings are consistent with a study conducted by Katuri KK et al., which found that 52.5% of people smoke 1-2 cigarettes daily. [30] In this study, 67.5% of smokers had this behavior for the previous 1-10 years, whereas Katuri KK et al. found that only 37.5% of smokers had this habit for the previous 6-10 years. [30]

The current study found that smokers with missing teeth had a higher mean than nonsmokers. 59.5% of smokers and 41.5% of non-smokers had at least one lost tooth. These findings are consistent with a study conducted by OjimaM et al, in which 40.6% of current smokers and 27.9% of nonsmokers had missing teeth. [8] Smoking conceals gingivitis, a primary indication of periodontitis, which leads to a lack of understanding of oral health, eventually leading to severe periodontitis and tooth loss.

Smoking predominantly affects the periodontium by interfering with the body's reaction mechanisms. In addition to its presence in gingival crevicular fluid, nicotine has been detected on the root surfaces of periodontally damaged teeth in smokers. It affects fibroblasts by enhancing collagen synthesis but inhibiting secretion. Nicotine alters the cell structure of the fibroblast. It is possible that smoking causes a comparable disruption in fibroblast attachment, rendering them more vulnerable to periodontal disease. Thus, smokers typically have considerably deeper probing depths and bone loss than nonsmokers, as well as increased tooth mobility, which eventually leads to tooth loss. [31]

In this study, 78.5% of smokers had pocket depths of 4-5mm, compared to 72.5% of non-smokers who had calculus and 13.8% who had bleeding. These findings are consistent with the study by Basavaraj et al.[6] The mean number of sextants with Score-3 and Score-4 was significantly greater among smokers, while the mean number of sextants with Score-1 was significantly higher among nonsmokers. The findings are consistent with the study by Goultschin et al. [32]

Overall, the study's findings demonstrated that smokers had much poorer periodontal health than nonsmokers. Smokers had less gingival bleeding, more calculus formation, likely pocket depth, and tooth loss than non-smokers. As a result, smoking can be identified as a substantial risk factor for tooth loss. Strategies concentrating on dental education and increased awareness of smoking's influence on oral health will reduce smoking prevalence among the adult population, resulting in lower tooth loss. Because smoking is an addictive habit, the dentist's supportive role is critical in attempting to improve an individual's dental and general health status through smoking cessation.

CONCLUSION

The present study revealed a highest prevalence of periodontal disease among smokers and this implicates that tobacco smoking is a common and strong risk factor affecting the periodontal health of adults living in the Modinagar city. It is also evident that the progression and excessive loss of periodontal support and resultant tooth loss in later life depends to a greater extent upon excessive smoking habits in adults. Therefore, it can be concluded that need for oral health education and tobacco cessation is higher among this population. The study's findings also underscore the necessity for preventive programs directed at young individuals, as many smokers develop this habit early in life. As a result, dental public health activities must be launched that emphasize the importance of smoking as well as oral hygiene maintenance in primary preventive efforts.

RECOMMENDATIONS

Dentists play an important role in raising public knowledge about the harmful effects of smoking on both oral health and overall health of an individual.

• Encourage dentists to ask about their patients' smoking habits and advise them to quit, highlighting both the hazards and advantages of quitting. As a result, smoking cessation should be considered in periodontitis therapy as well as in dental health prevention.

• Rural Indians continue to lack access to dental health care. So, health education initiatives and oral

health screening programs should be created to educate and raise awareness about the dangers of smoking among this neglected demographic.

• More dental hospitals and institutes should provide tobacco cessation programs. Integrating these services into the healthcare system is crucial, particularly for the Indian people.Tobacco smoking is one of the most addictive processes, so tobacco cessation efforts, including adequate counselling, must be expanded, and the public should be better informed about the availability and significance of such interventions.

• School-aged children should receive appropriate counseling and awareness programs. Dental care workers, in particular, should promote tobacco prevention methods among adolescents in order to ensure that our younger generation is smoke free.

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