

# Laboratorial and clinical impacts of tobacco on periodontal health: A systematic review

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## Abstract

Use of tobacco has been documented a significant risk factor for the progression of periodontal conditions. The consumption of tobacco is related to intensified depth of periodontal pockets and ligament detachment, alveolar bone loss and susceptible to tooth loss. The main aggravating part in development of periodontal disease is contributed by nicotine that is pharmaceutically active component and a primary constituent of tobacco. It have been documented that negative impact on periodontal tissues is due to hindrance in connective tissue proliferation as a result of affected gingival blood circulation and neutrophil, cytokine production caused by nicotine. Thus, abeyance of tobacco is most important part of periodontal treatments as this renders positive influence on the patients' oral and systemic wellbeing. Tobacco cessation has been included as a

part of periodontal therapy and encouraged by dental practitioners. Tobacco cessation counselling is required to educate patient and for the best interest of their oral health. The aim of this review is to report the clinical and laboratory findings on periodontal health. In additions risks involved in tobacco use and possible professional intervention has been discussed.

**Keywords:** Tobacco, Periodontal Diseases, Gingivitis.

## Introduction

It has been known since late 1040's that tobacco exhibits detrimental effects on periodontal tissues health when association of ANUG (Acute Necrotising Ulcerative Gingivitis) was noticed with smoking<sup>1</sup>. A diverse range of periodontal diseases have been investigated observing their relationship with smoking. A substantial amount of scientific literature is available on the basis of which this review has been formulated. The basic aim and objective of this review is to conduct effective review for having clear idea of tobacco's effect on periodontal health from the perspective adopted in clinical trial and error and to analyse the effect of tobacco consumption on periodontitis and its types (Chronic periodontitis, Aggressive periodontitis). Cross-sectional studies prove that smokers exhibit prevalence and severity of periodontal disease more than twice as compared to individuals who do not smoke. This is evidence that smoking exhibits a major connection with periodontal diseases. More cases of tooth loss are also reported in smokers with periodontal disease as it aggravates the pathological condition.

According to research conducted in 1997<sup>2</sup>, observe that negligence of oral hygiene among youth is ironical because they tend to be more health conscious, as the number of people visiting gyms and health clubs has increased with the onset of the new millennium. While awareness on diseases like obesity has received widespread awareness, the issues in relation to maintenance of oral health have not come into limelight. Life threatening diseases like cancer have been the chief concern of medics in relation to tobacco addiction.

The knowledge on maintaining proper oral hygiene among general people is very limited. From the onset of childhood pupils are taught about brushing twice

and dental flossing to keep the menace of tooth decay at bay. However, importance of food habit and lifestyle in relation to oral health remains ignored. Observing the adverse influence of smoking on periodontal health, the aim of this review is to highlight the unfavorable impact of smoking in relation to periodontal conditions and focus on cessation of smoking, highlighting its significance on periodontal health and outcomes of diseased periodontal tissues' treatment.

## Literature review

Epidemiological literature provides various evidences related to connection of smoking with detrimental periodontal diseases when studies of about more than two decades are reviewed<sup>3-5</sup>. The conclusions provided by Asmaand Tomar<sup>6</sup> based on statistics from the NHANES III study, may be considered a sturdy body of evidence of nicotine as a peril factor for periodontal diseases. Authors proposed that in USA almost fifty percent of patients suffering from periodontal pathologies were smokers. It was also noted that susceptibility of periodontal disorder was directly related to rate of smoking intensity of an individual and prevalent smokers were more than 3 times susceptible to periodontal diseases in comparison to non-smokers.

Literature based in clinical studies clearly reveals that smoking has deleterious effects on periodontal tissue; it causes quick and greater loss of periodontal attachment, gingival recession, pocket formation and bone loss in diseased condition<sup>7</sup>. Clinical study conducted by Mullally *et al.* in 2004 revealed that odds ratio between periodontal disease was as high as 14.1 for patients who smoked, exhibiting that smoking acts as the strong predator of progressive periodontitis, causing early loss of periodontal attachments and progression of other signs and symptoms.<sup>8</sup>

Connection between smoking and periodontal disease is known very clearly and proved by epidemiological studies but the true mechanism by which smoking causes deleterious effects on progression of periodontal pathology are still unknown.

## Methodology

To obtain the desire article following database will be use like Pub Med, Medline, Lancet, Google scholar, Cochrane library and from different organization who are actively working on tobacco like TTAC (tobacco technical assistance consortium America).

The following keywords will be used during searching; effects, role, tobacco, smoking, oral, mouth and periodontium or gingivitis. Articles published between 2000 and 2012 and in English

language were included for review of literature. English language was selected for articles so that reviewer did not face any difficulty in understanding of materials and thus kept himself away from any potential language bias in translating materials from one language to other.

Moreover with the aim that only studies relevant to the topic were included in the systematic review, this step was taken. This step of selection involved assessments of the study topic, their abstracts and list of references identified through search strategy. Full length reports of all potentially relevant articles were then accessed for eligibility assessment, which was based on review inclusion criteria<sup>9</sup>. Reference lists of eligible studies were then again analysed for obtaining further studies. Critical appraisal stage that is the last stage in selecting studies was done and the studies whose topic did not resemble with review, those published before inclusion review years and those which were not in English were excluded<sup>10</sup>. Even those studies in which participants' age was not clearly stated were excluded from review (as exclusion criteria of study). All studies were searched, analysed and selected by the researcher.

The study has been concluded based on three main forms of studies, epidemiological, laboratorial and studies based on perceptions of the common public on dental health care. For the epidemiological studies, the range of age varies from 18 and above. This is because; the rate of tobacco consumption is high among this particular age group. Since the consumption of tobacco is more common among males than the females, a gender based study has also been included in the research. An effort has also been made to find out cultural influences on tobacco consumption and its impact on gum diseases like periodontitis<sup>11</sup>.

For the study, the primary research outcome is formed based on the impact of tobacco intake on dental diseases like periodontitis.

On the other hand secondary outcomes are measured on laboratorial studies on the relationship of tobacco consumption and periodontitis. The already existing knowledge of dental healthcare professionals and their recommended ways to cessation of smoking are also measured. Awareness of general public on dental health and impact of tobacco are also taken into account to determine the research outcomes.

While conducting a research on any topic, it is very important to evaluate the quality of the studies that are selected to establish and attain the proposed research outcomes<sup>12</sup>. This is done with the objective to avoid any form of bias that may affect the research findings and outcomes.

In case of the concerned research study, the articles that are included are independently assessed by utilizing a critical appraisal framework. By following the framework, the researcher has been successfully

able to critically evaluate the qualitative and quantitative methods. As per CASP or Critical Appraisal Skills Programme, the framework consists of several questions that are keenly analysed to meet up factors like relevance of the study, the results, validity, reliability and similar such <sup>13</sup>. Through the aid of the questions for study assessment, the following segments of the entire study for instance, study design, objective of the research, target population sample, concerns related to research ethics, data analysis and findings and many such.

### Data Extraction and Analysis

For this research study, narrative synthesis of the research outcomes has been done as the data that has been extracted from each of the articles do not bring about similar quantitative findings and analyses. The data extracted from each of the study include, the process of identification of each study, determining the characteristics of the study and the ultimate results of the study. While identifying the study, the name of the researcher, title, publication year, origin of the study and such are found. The characteristics of the study on the other hand make sure that the aim of the study, study design along with inclusion and exclusion criteria.

The methods of data collection will be based on the nature and design of the study and also the source and kind of the collected data. Since, the data analysis of the study has been conducted by using the narrative approach; the study involves a process of detailed documentation. The document reflects relationship established between the understandings from all the studies and the evidence of overall validity of the studies made. As the study is not made in accordance to the meta-analysis format, an effective approach towards in detailed documentation and analysis of the research outcomes from various studies related to the topic has been adopted. The process of data analysis has been purposely made transparent by observing research ethics and values. Therefore, the entire study has been presented in a narrative format providing all possible details. This process has made way to effectively understand the relationship between tobacco consumption and development of gum diseases or periodontitis.

### Results

After analyzing literature, we concluded different tables (1, 2 and 3) with author's details, year of reporting, title of study, study design, which population targeted, country of study, their aims with result outcomes.

**Table 1: Epidemiological Studies**

Author Year of Publication	Title of Study	Study Design	Population/ Age	Country of Study	Aim/Aims of Study	Results
<b>D.F. Kinane and I.G. Chestnutt</b> <sup>14</sup>	Smoking and Periodontal Disease	Cross Sectional and Longitudinal Study on Patients	1361 Case (n= 873) Target Age Group 25-74	Erie County, New York State	Strength of Association between Tobacco and Periodontal	The risk of severe tooth and bone loss is more in case of smokers. Ratios vary from 3.25 to 7.28, from light smokers to heavy smokers.
<b>Brian H. Mullally</b> <sup>15</sup>	The Influence of Tobacco Smoking on the Onset of Periodontitis in Young Persons	Hospital Case Study	17, 22 Case, Target Age Group 17-34 years.	Africa	Prevalence of early onset or aggressive periodontitis in young adults.	Identification of significant genetic components in relation to aggressive periodontitis.
<b>Vandana K. Laxman and Sridhar Annaji</b> <sup>16</sup>	Tobacco Use and Its Effects on the Periodontium and Periodontal Therapy	Cross sectional	12,329 Case, Target Group 18 years and above	USA	Reviewing potential biological mechanisms related to effects of tobacco on periodontal disease.	Tobacco smoking significantly contributes to the development of periodontal disease.

<b>NurcanBud uneli</b> <sup>17</sup>	Effects of Tobacco Smoking on Chronic Periodontitis and Periodontal Treatment	Cross Sectional Study	550 Case Target Group 18 to 45	Turkey	Impact of Tobacco Smoking on Chronic Periodontitis	A positive association between smoking and various biochemical, clinical signs of periodontitis and chances of periodontitis among smokers.
<b>Jose Lopez-Lopez et al</b> <sup>18</sup>	Tobacco Smoking and Radiographic Periapical Status	Case Control Study	79 Case, Target Group – 18 and above	UK	Radiographic investigating the relationship between tobacco smoking and periapical status.	After taking into account the age, gender, total number of teeth, endodontic status, root filling quality and diabetic level, tobacco is strongly considered to be associated to periapical lesions.

**Table 2: Laboratorial Studies**

Author Name and Year of Publication	Title of Study	Country of Study	Aims and Objective of study	Results
<b>Cristina Cunha Villar and Antonio Fernando Martorelli de Lima</b> <sup>19</sup>	Smoking Influences on the Thickness of Marginal Gingival Epithelium	Brazil	Evaluation of the thickness of marginal gingival oral epithelium and non0smokers who have clinically healthy gingivae.	Among all significant negative consequences of tobacco on the periodontium, influence of tobacco on the various signs and symptoms of gingival inflammation that are induced by plaque accumulation must be necessarily considered. Smoking must be taken as a high risk factor for the development of chronic periodontal disease.
<b>FlonaM.Coll ins</b> <sup>20</sup>	Tobacco Cessation and the Impact of Tobacco Use on Oral Health	United States	Types of tobacco and its prevalence among US population. Impact of tobacco use on oral health. Biochemical and generic factors associated to oral health. Recommended methods for tobacco cessation.	Interventions made by an able dental team can help in quitting tobacco intake. The dental experts can effectively educate and motivate patients who suffer from the danger of tobacco on oral health. Interventions recommended on a routine patient care. Tobacco cessation can best be carried out under medical supervision and restrictions.
<b>GirishParma r, et al</b> <sup>21</sup>	Effect of Chewing a Mixture of Areca Nut and Tobacco on Periodontal Tissues and Oral Hygiene Status	India	Clarifying the effects of chewing areca nut and tobacco on periodontal tissue and status of oral hygiene.	Chewing areca nut and tobacco plays a causative role in the development of oral lesions, degradation of periodontal status and oral hygiene.
<b>MirnaMinay a-Sanchez et al</b> <sup>22</sup>	Prevalence of and Risk Indicators for Chronic Periodontitis in Males from Campeche.	Brazil	Determining prevalence of extension/severity of chronic periodontitis and determining the various risk factors among the policemen of Campeche, using electron probe.	Many of the participants were found to suffer from poor periodontal disease. Over use of tobacco along with aging causes presence of gingivitis.

**Table 3: Studies based on Knowledge and Service Delivery**

Author Names and Year of Publication	Title of the Study	Design of Study	Target Population	Country of Study	Aims and Objectives	Results
<b>ZHS Lung, MGD Kelleher, R W J Porter, J Gonzalez and R F H Lung.</b> <sup>23</sup>	Poor Patient Awareness of the Relationship between Smoking and Periodontal Diseases.	Cross Sectional Survey based on well-structured interview	Smoker patients attending dental clinic	London, UK	Investigating patient's knowledge of the effects of smoking on periodontal disease.	The patients were found to be less aware of the relationship between smoking and periodontal diseases as only 6% of the total were aware of the fact.
<b>Yuval Vered and Harold D Sgan-Cohen.</b> <sup>24</sup>	Self-perceived and clinically diagnosed dental and periodontal health status among young adult and their implications for epidemiological surveys.	Cross Sectional Survey based on well-structured interview	21 year old Israeli Defense Forces after being released from military services.	Israel	Investigating parity between self-perceived and clinically diagnosed dental and periodontal health status.	The self-assessment of individuals was found to have been low. The low level awareness will directly impact care-taking behavior and need for public health action.
<b>ShaileeFotedar et al, et et al</b> <sup>25</sup>	Knowledge of Attitude Towards and Prevalence of Tobacco Use Among Dental Students in Himachal Pradesh.	Cross Sectional Survey based on well-structured interview	Third year Students of Bachelor of Dental Surgery.	India	Assessing prevalence of tobacco and its use along with knowledge of cessation counseling among dental students in the state of Himachal Pradesh, India.	The prevalence of tobacco use among the students is found to be low. Though, use of skills to support quitting of smoking is necessary.

## Discussion

Regarding the “influence of tobacco smoking on the onset of periodontitis in young person’s” written by Brian H.Mullally<sup>8</sup>, in which he has tried to explain his views on the extent of cigarette smoking can actually put forth on periodontal tissues were not completely agreed by other theorists like. According to Vandana K. Laxman and Sridhar Annaji<sup>2</sup>, its consequences are linked to the period and number of cigarettes consumed. The smoking habits of the family members may also be significant both in view to behavioral influences and the probable results of passive smoking<sup>26</sup> is of the opinion that the second spot is in need of additional research. Moreover

having a variety of general consequences which can change the reaction of the effected person, cigarette smoking would also emerge to have substantial limited effects which may report for the early establishment of the disease development in, at risk young adults. Legal restrictions in the developed countries like U.S or Europe has barred the tobacco companies for their advertisements and sales and thus these companies have targeted the developing countries as their replacement. Thus, the developing nations are susceptible to face an increase in the prevalence of harsh periodontal situation including acute periodontitis. To be able to follow the strategies of avoidance, early recognition of the disease and quick intrusion by the dental professionals should be able to aim and inform the young patients about the

consequences of smoking on periodontal health. By this mode dental department will also be playing a major role in the general health and well-being of the youth.

By the epidemiological study about the treatment of the individuals addicted to cigarettes, the theorists have suggested that non-surgical treatment will generally be productive in requisites of penetrating depth reduction and gingivitis. Thus the consequences of smoking on the result of periodontitis treatment may be concluded as Short term effects in terms of less gingivitis resolution, less probing depth reduction, less attachment gain among the smokers.

It has been noticed and stated by López-López, J.,<sup>18</sup> 80 to 90% of the cases in long term effects are treatment failures among the smokers. He has also stated that 70-80% of the cases are not successful in the implantation among the smokers. Thus smoking does have a negative effect on the treatment procedure of the periodontitis diseases. Keeping this in mind, the patients suffering from periodontitis diseases need to be advised and counselled about the consequences of smoking.

Study on effects of tobacco use on periodontal health and treatment has made evident that over the past 50 years, knowledge and concern about obnoxious effects of tobacco smoking on periodontal health has progressed significantly. Hence, in today's world there is little doubt on the fact that tobacco smokers are at a high risk of getting affected by periodontitis. They are also found to be slow responders to periodontitis treatment.

Tobacco smoking in fact, is found to have wide spread effects on oral health. The mechanisms of tobacco smoking for increased level of susceptibility to periodontitis and poorer response to remedial treatments are some of the ill-effects on over all oral health and recovery process. Another, significant outcome of the tobacco smoking is that it acts as a strong environmental factor. Smoking of tobacco interacts with the body of host and bacterial growth associated with the disease periodontitis<sup>14</sup>. The genetic built of the host and interaction with the environmental factors like cigarette smoking makes way to further exploration of the relationship between tobacco smoking and related genetic factor of the host.

The effects of tobacco smoking on formation of chronic periodontitis have also been found to impair the microcirculatory system and changes on the vascular formation system. This in turn leads to negatively influence the immune system and inflammatory reactions on healthy periodontal tissues. It is found that smokers have less number of vessels and existence of highly inflamed gingival tissues as compared to non-smokers. According to researchers it has been found that smoking of tobacco

on long term basis makes a negative impact on the process of vasculature of the periodontal tissues. Also, high level exposure to long term smoking leads to gingival hyperaemia. The gingival hyperaemia is mainly caused due to increase in blood pressure levels in comparison to small yet significant sympathetic vasoconstriction on healthy gingival tissues<sup>22</sup>.

Due to continued process of repeated attacks of vasoconstriction and presence of impaired revascularization caused due to cigarette smoking may lead to low rate of immune response, delayed healing process and ultimately increased risk of periodontal disease<sup>21</sup>.

It is quite evident from the study on tobacco smoking and radiographic periapical status that there is a statistically significant association between radiographically diagnosed lesions and tobacco smoking. In this particular study the oral health maintained by the subject was quite satisfactory but due to tobacco smoking, there had been consistent bone loss. Also, among smokers it was found that functions of polymorph nuclear leukocytes, T-cell lymphocytes, antibodies, immunoglobulin's A, G and M and macrophages are highly suppressed<sup>18</sup>.

The swelling results due to the dental plaque gathering can be modified by tobacco by-products, such as cotinine, a by-product of nicotine that has a marginal vasoconstriction action that decreases gingival clinical symptoms of bleeding, redness, and oedema. The morphometric investigation showed an augment in the MET in clinically healthy gingival samples in comparison to the swelled samples in the case of both smoking and non-smoking patients. This difference did not attain statistical implication. The gingival swelling decreases the epithelial thickness and can lead to clinical ulceration<sup>19</sup>. The findings thus propose that among all the adverse effects of tobacco on the periodontium, the effect of tobacco related to the symptoms of gingival swelling caused by plaque gathering should be taken into consideration. Even though the accurate means of its power is still not very clear, yet smoking should be considered to be the main risk factor for chronic periodontal disease.

## Conclusions

Smoking is a well-known causing and aggravating factor for periodontal problems. Smokers exhibited more than twice chances of having periodontitis. Therefore, cessation of smoking plays a significant role in the cure of periodontal diseases. Patients should be educated and motivated by their dentists to quit smoking. Dentists can have very effective and influential position, as patients tend to visit them more regularly in comparison to their physicians. However, success in cessation of smoking may be

certainly influence by mutual coordination among dentists and physicians.

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