

Smoking as A Risk Factor for Periodontitis in Erbil City

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Doi: 10.23918/eajse.v9i1p1

Abstract: Background and Objective: Nicotine in cigarettes can harm the immune system and lead to constriction of blood vessels, plus the blood vessels in the tissues encircling the tooth. Constriction of blood vessels can form an encouraging environment for the growth of microorganisms that cause periodontal disease. The purpose of this study is to verify the risk of smoking on the periodontal health status. **Material and Method:** a comparative cross-sectional study carried out on 400 patients including 200 smokers and 200 nonsmokers of age range (18-64) years. Chi-square test was used to compare data recorded (p-value <0.05). **Results:** Most of the smokers were male. Most of the participants didn't use interdental aid. There was a significant relation between age, gender, smoking habit including frequency and duration, oral hygiene habit, and dental care visit with periodontitis (P-value <0.05). **Conclusion:** The current study demonstrates smoking as the major etiological factor associated with periodontal tissue destruction.

Keywords: Smoking, Periodontitis, Oral Health

1. Introduction

Periodontitis is defined as “an inflammatory disease of the supporting tissues of the teeth caused by specific germs or groups of specific microorganisms, that lead to the progressive deterioration of the periodontal ligament and alveolar bone with pocket development, recession, or both” (Newman et al., 2015). The periodontal disease is one of the most common chronic diseases after dental caries causing tooth loss among adults in developed countries (Lung, 2005; Abdulkarim, 2005).

Smoking is now recognized as a key risk factor for periodontitis, impacting the disease's epidemiology, range, and severity” (Newman et al., 2015). Smoking is regarded to affect the immune response and affect the periodontal tissue's capacity to heal. Following an interval of disease onset. The constriction of the blood vessels occurs, including the gingival blood vessels, so reduce the oxygen level in the tissue and leads to disturbance of immune response which forms a favorable habitat for periodontal pathogens and it will increase the colonization and amount of bacteria in the periodontal pocket (Newman et al., 2015; Johnson & Hill, 2004; Elahe et al., 2015; Johnson & Guthmillar, 2007).

It has been evaluated that a three-quarter of the male adult population around the world smokes, among the young population which ages between 13 to 15 years, one in five smoke globally. Daily between 80,000 and 100,000 children begin smoking globally. The rate of cigarette smoking is increasing in the developing countries while it's dropping in the developed countries. Everyday 15 billion cigarettes are sold, or in another word, 10 million cigarettes are sold per minute (WPRO, 2017). Obviously, smoking has a great impact on the periodontal ligament breakdown and healing capacity of periodontal tissue (Johnson & Bain, 2000).

Received: August 1, 2022

Accepted: September 18, 2022

Azeez, S.M., (2023). Smoking as A Risk Factor for Periodontitis in Erbil City. *Eurasian Journal of Science and Engineering*, 9(1),1-13.

The National Health and Nutrition Examination Survey (NHANES III) looked at 15 million cases of periodontitis in the US to see if there was a link between smoking and periodontitis. Periodontitis was four times more likely in smokers than in nonsmokers, and it was 1.68 times more likely in past smokers than in nonsmokers (Tomar & Asma, 2000). Smokers are three times more likely than nonsmokers to develop periodontitis, according to a meta-analysis of data from six different research (Papapanou, 1996).

Periodontitis was shown to be prevalent in 23 percent of smokers in an Australian survey. Past and current smokers had significantly higher prevalence of periodontitis than nonsmokers in unadjusted analyses (Do et al., 2008). In a Japanese survey, smoking patients aged 40 and older were 1.4 times as likely to have periodontitis and more severe form in current smokers compared with non-smokers (Ojima et al., 2006). In Thai survey, smoker patients were 4.4 times likely for severe periodontitis than nonsmokers (Torrungruang et al., 2005). Periodontitis was found to be most common (17.6%) among former smokers and least common among non-smokers in a Jordan survey (7.4 percent). Between the periodontitis and healthy groups, there was a statistically significant difference in the prevalence of periodontitis related to cigarette smoking (Ababneh et al., 2012).

To date, however, no estimation has been published of the proportion of adult periodontitis in the Erbil city that could be attributed to cigarette smoking, so the purpose of this study is to determine the smoking as a risk factor for the periodontitis among the patients attending Tishk International University. While the objectives are:

1. Determine the relation of smoking, the frequency of smoking, and duration of smoking with periodontitis.
2. Compare periodontal health status of smokers with non-smokers by determining the effect of toothbrushing, the frequency of tooth brushing, interdental aid and dental care visit.
3. Determine the relation of age and gender with smoking and periodontitis.

2. Material and Methods

The current comparative cross-sectional study was conducted on patients who visited Tishk International University's Periodontology Department in Erbil. There were 200 smokers and 200 nonsmokers among the 400 patients. Male and female participants ranged in age from 18 to 64 years old. The individuals were Erbil/Iraq residents. If the subject answered "Yes" to the item about smoking on the case sheet questionnaire, she or he was classed as a smoker (Group A). According to the smoking index (Table 1), those who answered "No" were classified as nonsmokers (Group B), and past smokers were excluded from the study. Nonsmokers and smokers were both assessed.

Table 1: Classification of smoking according to smoking index (Cigarette smoking behaviour, 2017)

Code	Classification
1	A regular smoker is someone who smokes one or more tobacco cigarettes each day, whether they are manufactured, or hand rolled.
2	Ex-smokers are those who used to smoke one or more tobacco cigarettes each day, either manufactured or hand-rolled.
3	Never smoked – someone who has never smoked or smoked less than one per day, either manufactured or hand-rolled tobacco cigarettes.

Smokers had smoked one cigarette per day for at least one year. By history from the questionnaire of the case sheets the subjects were asked about whether they brush their teeth or not and the frequency of brushing per day classified as once, twice, occasionally, or never. They were also asked about the using of interdental aid classified as yes or no.

Wisdom teeth, deciduous dentition, artificial teeth, past smokers, patients having a complicating medical condition like diabetes, pregnancy, patients using any drug which may influence the periodontium like phenytoin, cyclosporine, nifedipine, etc., cardiovascular diseases history or any other conditions that required prophylactic antibiotics were disqualified from the study.

Patients were clinically evaluated by examining intraorally on the dental chair below good light, using dental mirror, Merritt periodontal probe having length 10 mm and dental probe to find out periodontal health status according to periodontal index criteria (Table 2), which score six was included in this the study (Russell, 1956; Russell, 1967). Measurements were done at six sites per tooth, mid-buccal, mesiobuccal, distobuccal and mid lingual, mesiolingual, distolingual.

Table 2: Diagnostic criteria of periodontitis by Russel

Score	Criteria and scoring for field studies
0	Negative: There is no visible inflammation in the gingival tissues, nor is there any loss of function due to supporting tissue deterioration.
1	Mild gingivitis: the free gingiva has a distinct area of inflammation, but it does not surround the tooth.
2	Gingivitis is characterized by inflammation around the tooth, but no visible break in the epithelial connection.
6	Pocket formation with gingivitis: the epithelial connection has been disrupted and a pocket has formed (not merely deepened gingival crevice due to swelling in the free gingiva). The tooth is firm in the socket and has not strayed, thus normal masticatory function is not hampered.

8	The tooth may be loose, displaced, sound dull on percussion with a metallic instrument, or be depressible in its socket due to advanced deterioration with the loss of masticatory function.
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2.1 Statistical Analysis

Data was evaluated on computer program SPSS version 22. Mean, and SD was assessed for age. Frequency was calculated for gender, age, the frequency of cigarette smoking, duration of cigarette smoking, dental care visit, brushing, the frequency of brushing, and interdental aid. Mean age was compared using ‘t’ test. A Chi-square test evaluated the clinical category. The comparison was regard as significant at ‘p’ value <0.05.

3. Results

The mean ($\mu \pm SD$) age of 400 participants in the present study was 33.9625 ± 10.50819 . While among this study sample 200 participants were smokers with a mean ($\mu \pm SD$) age of 34.1200 ± 10.00028 . 200 participants were nonsmokers with a mean ($\mu \pm SD$) age of 33.805 ± 11.01561 . There were no statistically significant differences in the ages of smokers and nonsmokers (P-value >0.05) (Table 3). There is a significant relationship between aging process and periodontitis (p-value <0.001) (Table 5).

Table 3: Comparison of age between smokers and nonsmokers

Group	N	Mean age	Standard deviation	P-value
Non-smokers	200	34.1200	10.00028	0.765
Smokers	200	33.8050	11.01561	

Approximately three-quarters of the participant were male (fig 1). Only eight females were smokers, there was a significant relation between the gender of the participants and smoking habit (P-value <0.001) (Table 4). In the present study, the percentage of males (47.1%) that had periodontitis was significantly higher than the percentage of females (33.6%) that had periodontitis (P-value 0.016) (table 5).

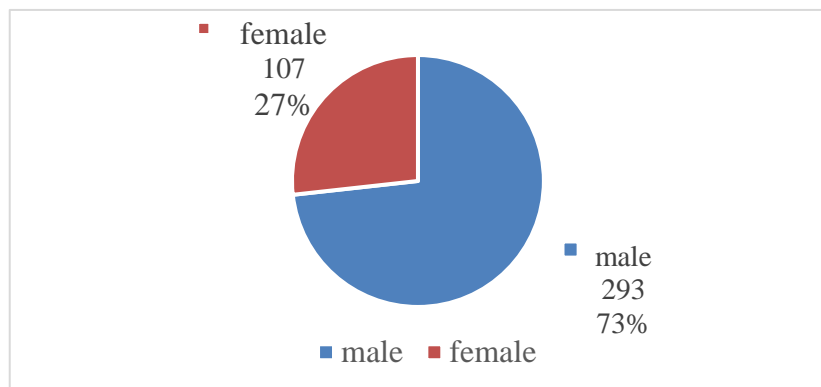


Figure 1: Distribution of samples according to gender

Table 4: Gender distribution regarding the smoking status

Group	Smoking status		Total	P-value
	Smoker	Non smoker		
Gender				
Male	192(65.5%)	101(34.5%)	293(100%)	≤0.001
Female	8(7.5%)	99(92.5%)	107(100%)	

Table 5: Relationship between periodontitis with age and gender

Groups	Periodontitis		Total	P-value
	yes	no		
Gender				
Male	138(47.1%)	155(52.9%)	293(100%)	.016
Female	36(33.6%)	71(66.4%)	107(100%)	
Age				
18-32	59(28.8%)	146(71.2%)	205(100%)	0.001
33-47	74(51%)	71(49%)	145(100%)	
48-64	41(82%)	9(18%)	50(100%)	

Among the smokers, most individuals consumed >1 or <20 cigarette daily (Fig 2), the proportion of the periodontitis (51%) among the smokers was significantly higher than the proportion of periodontitis (36%) among the nonsmokers (P-value <0.002) (Table 6). In this study 48.8% of the individuals who smoked 1 to 20 cigarettes per day, compared with 56 % of the individuals who smoked 20 to 40 cigarettes per day and 72.7% of the individuals who smoked >40cigarettes per day. The results showed that there was a significant relationship between the frequency of daily cigarette consumption and periodontitis (P-value <0.05) (Table 6).

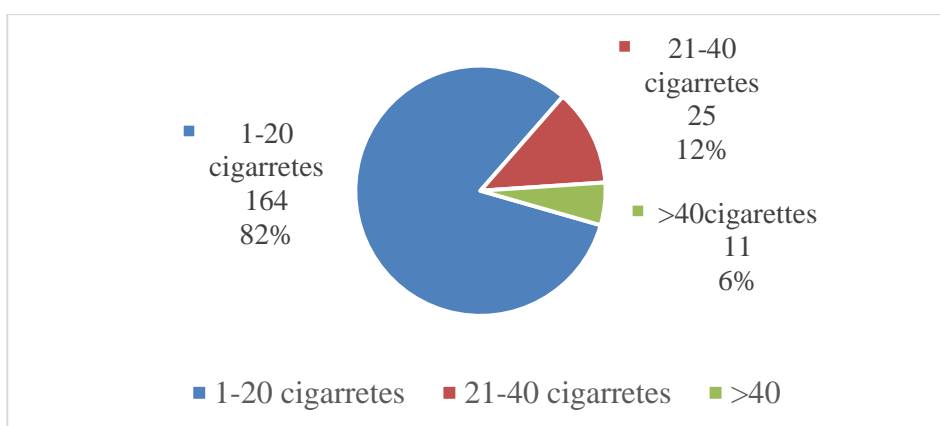


Figure 2: Distribution of samples according to the frequency of smoking per day

Table 6: Relationship between periodontitis with smoking status

Groups	Periodontitis		Total	P-value
	yes	no		
Smoking				
Yes	102(51%)	98(49%)	200(100%)	0.002
No	72(36%)	128(64%)	200(100%)	
Frequency of smoking per day				
1-20	80(48.8%)	84(51.2%)	164(100%)	0.008
21-40	14(56%)	11(44%)	25(100%)	
>40	8(72.7%)	3(27.3%)	11(100%)	
Duration of the smoking				
<10 years	48(41.7%)	67(58.3%)	115(100%)	0.001
10-19 years	29(51.8%)	27(48.2%)	56(100%)	
20-30 years	25(86.2%)	4(13.8%)	29(100%)	

More than half of the participants smoked less than ten years (Fig 3), in this study the results showed that the relation between percentage of smoking duration with periodontitis was very highly significant (P-value <0.001) (Table 6). About 190 participants visited their dentist occasionally (Fig 4), about 68.9% of these 190 participants had periodontitis, there was a statistically significant relationship between dentist visiting and periodontitis (P-value <0.001) (Table 7).

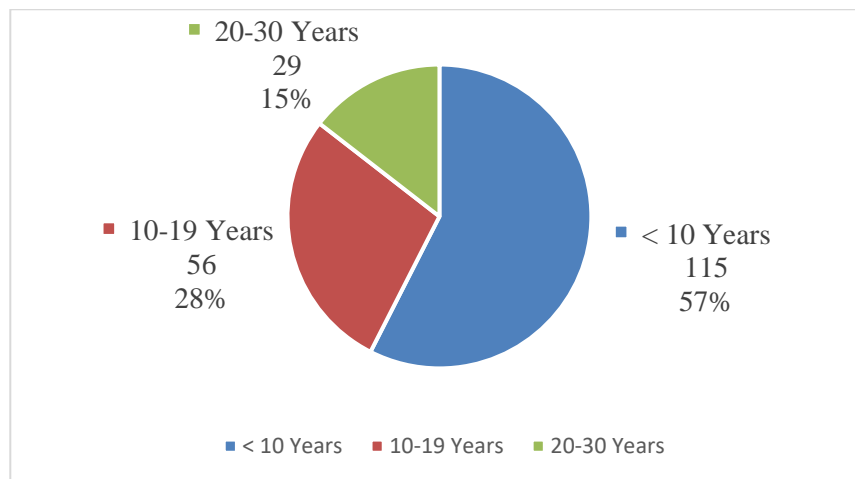


Figure 3: Distribution of the samples according to the duration of cigarette smoking

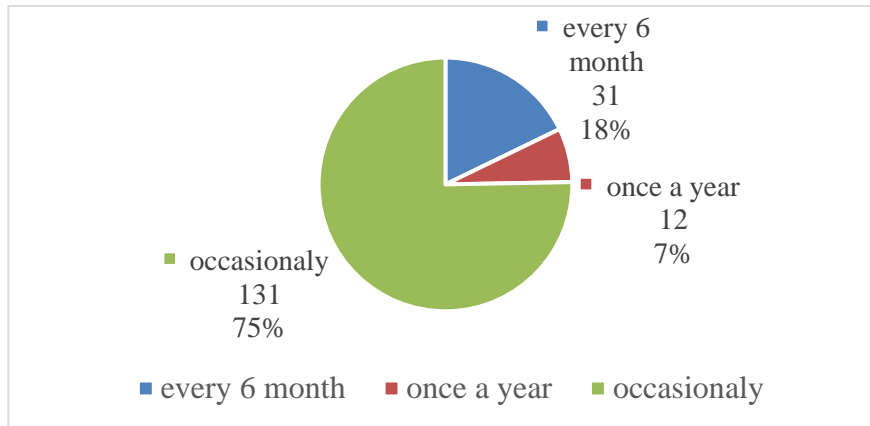


Figure 4: Distribution of samples regarding dental care visit

Table 7: Relationship between periodontitis and dental care visit

Groups	Periodontitis		Total	P-value
	yes	No		
Dental care visit				
Every six month	31(43.1%)	41(56.9%)	72(100%)	<0.001
Once a year	12(8.7%)	126(91.3%)	138(100%)	
Occasionally	131(68.9%)	59(31.1%)	190(100%)	

Most of the participants (89.3%) brushed their teeth (Fig 5), only 28 smokers didn't brush their teeth while the majority brushed their teeth, there is a statistically significant difference among the participants regarding the smoking habit about the brushing habit (P- Value <0.05) (Table 8). The proportion of periodontitis (74.4%) among the non-brushers was significantly higher than the proportion of periodontitis (39.8%) among those who brushed their teeth (p-value <0.001) (Table 9). 20% of the participant brushed their teeth occasionally (fig 6). The proportion of periodontitis (51.3%) among the participants who brushed their teeth occasionally was significantly higher than the proportion of periodontitis (41.8%) among the participants who brushed their teeth once a day (P-value <0.001) (Table 9).

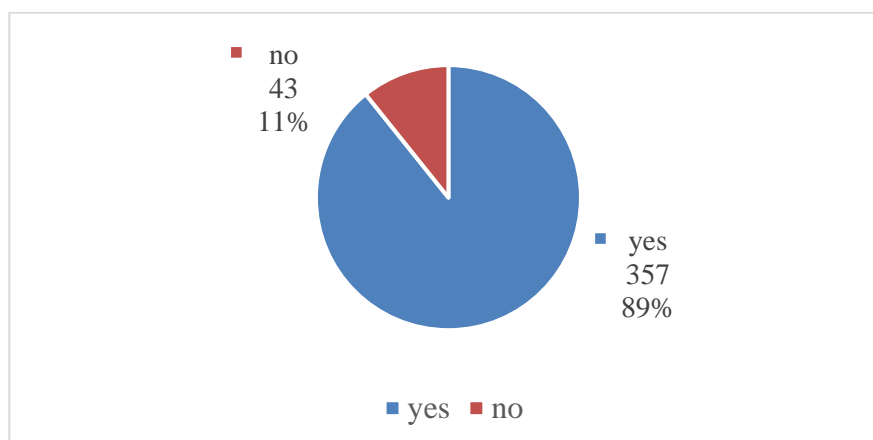


Figure 5: Distribution of sample according to brushing criteria

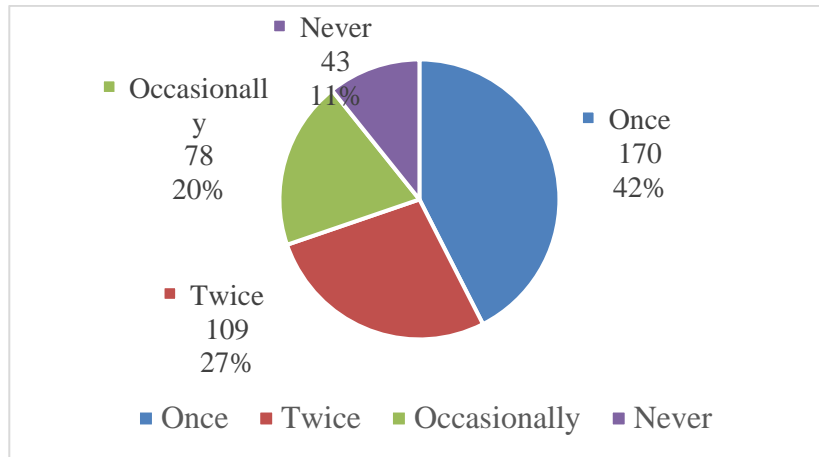


Figure 6: Distribution of samples according to the frequency of brushing

Most of the individuals were not using interdental aids (Fig 7), the majority of them were smokers, there is a statistically significant relation between smoking habit and the usage of interdental aids (<0.001) (Table 8). The proportion of the periodontal disease (45.6%) among the participants which did not use interdental aid was significantly higher than the proportion of the periodontal disease (31.7%) among the participants which used an interdental aid (P-value <0.001) (Table 10).

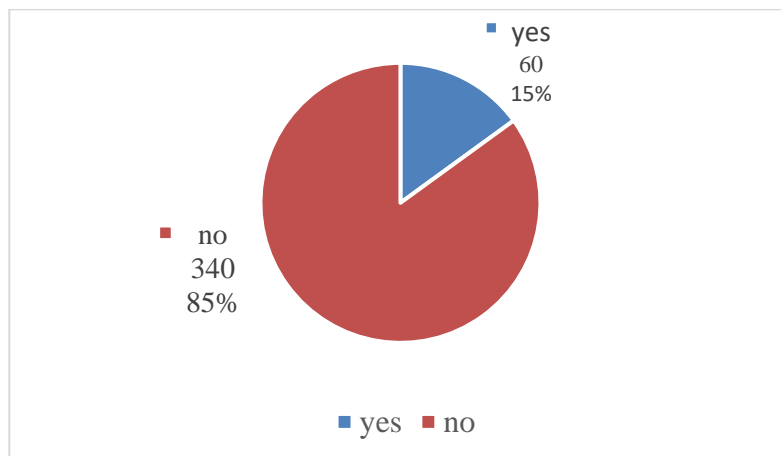


Figure 7: Distribution of the samples according to the using of interdental aid

Table 8: Relationship between smoking with oral hygiene habit

Group	Smoking habit		Total	P-value
	smoker	Non smoker		
Brushing				
Yes	172(48.2%)	185(51.8%)	357(100%)	0.036
No	28(65.1%)	15(34.9%)	43(100%)	
Interdental aid				
Yes	13(21.7%)	47(78.3%)	60(100%)	<0.001
no	187(55%)	153(45%)	340(100%)	

Table 9: Relationship between periodontitis and brushing habit

Groups	Periodontitis		Total	P-value
	yes	no		
Brushing				
Yes	142(39.8%)	215(60.2%)	357(100%)	<0.001
No	32(74.4%)	11(25.6%)	43(100%)	
Frequency of brushing				
Once	71(41.8%)	99(58.2%)	170(100%)	<0.001
Twice	31(28.4%)	78(71.6%)	109(100%)	
Occasionally	40(51.3%)	38(48.7%)	78(100%)	
Never	32(74.4%)	11(25.6%)	43(100%)	

Table 10: Relationship between periodontitis and interdental aid

Groups	Periodontitis		Total	P-Value
	Yes	No		
Interdental aid				
Yes	18(31.7%)	41(68.3%)	60(100%)	<0.001
No	155(45.6%)	185(54.5%)	340(100%)	

4. Discussion

The purpose of this study was to compare the demographic features of smokers and nonsmokers, as well as periodontal clinical parameters. When compared to nonsmokers, the researcher hypothesized that there is a strong link between cigarette smoking and periodontitis. In this study, the clinical periodontal breakdown was measured by the periodontal index, which the greater clinical periodontal breakdown was found among the smokers when is compared with the nonsmokers. The difference between smokers and nonsmokers was statistically significant (P-value <0.05) supporting the hypothesis of this study. This finding can be explained by the characteristics of many cigarettes by-product which is nicotine; causes the peripheral vasoconstriction which means it decreases the transportation of oxygen and nutrients to the periodontal tissue. Smoking also damages the local and systematic elements of the immunity which is involved in the preserving the health of the periodontium.

The findings are consistent with Tomar & Asma (2000) reported that periodontitis was related to smoking in 74.8% of current smokers and agreed that smoking is a major risk for developing the periodontitis. Smokers are four times likely to have periodontitis than nonsmokers and may be accountable for more than half case of periodontal disease adult smokers in the United nation. A study done by Calsina et al. (2002) showed that the rate of the periodontal disease developing was greater among the smoker than the nonsmokers independent of age and gender. In other studies, by Nanto

(2005), Kaleem et al. (2009), and Suratri & Notohartoyo (2016), this studies all found a strong association between cigarette smoking and periodontitis similar to this study.

In the present study, the relation between the frequency of the smoking with the periodontitis was significant. As the frequency of daily consumption of cigarettes increased the participants had a greater probability of having periodontitis this may be due to disruption in the cellular and the host immune response of the periodontal tissue. This finding is like the Matinez-Canut et al. (1995) which concluded that the periodontitis among the smokers is dose-dependent across the ages. Tomar & Asma (2000) also reported that among the smokers 64.2% were smoking ≤ 9 cigarettes per day and 83% were smoking ≥ 9 cigarettes per day had periodontitis, concluded that there is a dose-response relationship with periodontitis. Calsina et al. (2002) also revealed there is a relationship between the amount of cigarette consumption and advance periodontal disease. Kaleem et al. (2009) showed that the individuals smoke more ten cigarettes per day have higher chance to have periodontitis than the individuals which smokes less than ten cigarettes per day. Susin et al. (2011) reported periodontitis rate is higher among heavy smoker than the light smokers.

The duration of cigarette smoking also has an effect on the periodontal health as the results of this study showed a significant relationship between them. This may be due to long-term exposure to nicotine which produces inflammatory response and damages the periodontal health. This outcome is similar to Machuca et al. (2000) and Calsina et al. (2002) which they have proved that the periodontal disease is more in the individuals who smoke for a longer period. Persson et al. (2005) showed that the individuals who smoked more than 30 years had significant relation with periodontitis. Another study done by Bergstorm (2003) reported that with increasing frequency of cigarette smoking and duration of exposure there is more chance to periodontitis.

The rate of periodontitis among the male gender was higher than the female gender; this may be due to the smoking habit in the society which is more prevalent among the male gender than the female gender. This result is similar to the study done by Suratri & Notohartoyo (2016) which revealed that 96.9% of the male had periodontitis when compared with 93.5% of females (Odds ratio= 1.05). In another study by Ojima et al. (2006) also showed that a greater percentage of male (49%) had periodontitis when compared with the females (38.3%). Calsina et al. (2002) also found that the periodontitis was more severe in the male than the female. The reason for these findings in these studies may be due to poor oral hygiene behavior and dental care visit among male than females (Ojima et al., 2006; Suratri & Notohartoyo, 2016).

In the present study, there is a strong association between the age and periodontitis as the age advances the probability of having periodontitis rises this finding is unclear it might be due to physiological changes which happen due to the aging process or prolonged exposure of the individuals to true etiological factor that might cause periodontal disease. Horning et al. (1996), and Amarasena et al. (2002) found that age only may be the most important parameter for periodontitis. Suratri & Notohartoyo (2016) also found that the individuals older than 30 years old had periodontitis more than the individuals younger than 30 years old.

Most of the smokers were brushing their teeth; this may be due to increased awareness among the smokers regarding the oral hygiene habit. The percentage of periodontitis among the participants which didn't brush their teeth was significantly higher than among the individuals who brushed their teeth (p-value <0.001). The frequency of brushing had a great impact on the periodontal health, those who brushed their teeth occasionally had a higher probability of having periodontitis than those who

brushed their teeth once or twice per day (P-value <0.001). Most of the participants either smoker or nonsmokers did not use interdental aid, which may be due to ignorance of the participants to the benefits of the interdental aids in the maintenance of oral health status. These findings are similar to the Machuca et al. (2000) and Kerdvongbundit & Wikesjö (2000) reported that the poor oral hygiene is associated with the periodontitis.

Higher prevalence of periodontitis was noticed among the participants who visited their dentist occasionally than those who visited their dentist once or twice a year, probably may be due to difficulty in affording dental treatment. Susin and Albandar (2005) and Ababneh et al. (2012) had similar results in their study.

5. Conclusion

The current study demonstrates that smoking is the major etiological factor associated with periodontal tissue destruction. This study also shows that periodontitis is more prevalent in male gender and older age. The severity and extent of periodontitis in the old population depends on the frequency and duration of smoking in the young age. The oral hygiene maintenance has a great impact on the oral health status.

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