Assessment of The Relationship of Oral Hygiene Habits and Sociodemographic Status With The Periodontal Health of Patients Attending The Faculty of Dentistry

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ABSTRACT

This study aims to evaluate the relationship of oral hygiene habits and sociodemographic status with the periodontal health of patients who attended the faculty of dentistry, using personal information and clinical examinations.

A total of 1002 patients (age ranging from 18 to 69 with a mean age:38±13.3) were included in this study. Individual characteristics, smoking and oral hygiene habits, and systemic and dental histories were recorded. Plaque and calculus index, the presence of bleeding on probing (BOP), attachment loss and pocket depth parameters were recorded as clinical data. After patients' data were recorded, the relation of these parameters to attachment loss, pocket depth, prevalence of periodontal disease and BOP was determined.

Three hundred and eighty-nine of the patients were diagnosed with periodontitis and prevalence was significantly higher among males (45%) (p < 0.05). The percentage with periodontitis was significantly lower in individuals aged 18–39 (28.4%) compared to individuals aged 60 and over (64.8%) (p < 0.05). Periodontitis was diagnosed in 62.2% of those who did not brush their teeth. The percentage with periodontitis reached a peak of 52.9% among heavy smokers (p < 0.05). Mean attachment loss and probing depth increased significantly with age (p < 0.05). The prevalence of BOP was lower among university graduates and those who used dental floss (p < 0.05).

Demographic characteristics, smoking and dental behaviours are associated with periodontal health. Improving sociodemographic status, preventive education and therapeutic services can be a way to improve oral health.

Keywords: Attachment loss, Bleeding on probing, Oral hygiene, Periodontitis, Smoking

Introduction

The gingiva, periodontal ligament, cement and alveolar bone are the parts of the periodontium that surround the teeth and enable functional and morphological integrity. Under normal conditions and in a healthy periodontium, these tissues continue their biological adaptation and regeneration phases in harmony (1). Periodontal disease is an oral infection caused by Gram-negative bacteria which is clinically and radiographically followed by gingival inflammation, periodontal tissue damage and alveolar bone loss. It is defined as gingivitis when periodontal disease is limited to the gingiva, and as periodontitis when it progresses with destruction of the tissues surrounding the tooth (2). Even though microbial dental plaque is the major aetiological factor in periodontal disease, previous studies have revealed that periodontal health may also be affected by systemic disease, oral care habits, and demographic and socioeconomic status (3). Among these factors, those that cannot be changed are age, gender and genetics, while the changeable factors are oral hygiene, systemic diseases, smoking, stress and socioeconomic status (4). Similar to the course of many infectious diseases, periodontal disease can be treated more easily and successfully when diagnosed early. It is already known that oral hygiene care and periodontal treatment are very important, especially in preventing tooth loss and maintaining periodontal health (5). Furthermore, periodontal disease can cause tooth sensitivity, bleeding, oral malodour, gingival recession, and tooth mobility and loss, and as a result of all

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these, the daily activities and quality of an individual's life can be affected (6). The positive effects of plaque control on periodontal health have been demonstrated with clinical periodontal parameters in studies conducted to date (7).

In Turkey, the symptoms of periodontal disease are often ignored by individuals; also, patients refer to dentists in the advanced stages of periodontal disease when mobility, tooth sensitivity or severe gingival bleeding occur. Therefore, the diagnosis and consequent treatment requirements cannot be fully realized so periodontal disease is quite common in society. The need for treatment in a community is directly related to the severity and incidence of periodontal disease (8). Therefore, in line with the results of previous epidemiological studies on periodontal disease, oral health questionnaires and clinical measurements can be considered as the reliable methods to determine the current oral-dental health status in the community and to plan the necessary treatments and preventive models for that population (9). In Turkey, a limited number of studies have been conducted on the periodontal health and oral health care habits of patients who attended the faculties of dentistry (10,11). Therefore, this study aims to evaluate the relationship between oral hygiene habits and sociodemographic status and the periodontal health of patients who attended the faculty of dentistry, using personal information and clinical examinations.

Material and Method

Study design and population: This study was conducted at the Eskişehir Osmangazi University Faculty of Dentistry Department of Periodontology in a group of 1002 patients (age ranged from 18 to 69 with a mean age: 38 ± 13.3). The design and protocol of the study were in compliance with the Helsinki Declaration and approved by the Ethics Committee of Eskişehir Osmangazi University (Approval No: 80558721-050.99-E.86844).

Data collection: All participants were informed about the study, signed a consent form and answered the questionnaire which was prepared for the routine clinical examination for each patient who applied to Eskişehir Osmangazi University Periodontology Department Periodontology Department. A questionnaire included a total of 18 questions focusing on details like individual characteristics, education level, smoking and oral hygiene habits, systemic and dental histories, and indices of periodontal parameters. While developing this questionnaire, the themes identified in the literature, existing questionnaires, and target research groups were taken into account (12). While the age groups were divided into 18–39, 40–59 and ≥ 60, the education level was determined as 1 –primary school, 2 – high school or 3 – university/master/doctorate. For evaluating oral hygiene habits, flossing was recorded as using or non-using, and tooth brushing was recorded as once daily, twice daily, occasional or absent. The daily smoking habits of the patients were recorded, and the groups were determined as follows: non-smokers, light smokers (smoking fewer than 10 cigarettes per day) and heavy smokers (smoking 10 or more a day). All periodontal indices and measurements were determined under equal clinical conditions and in the same order in each subject. Plaque index (13) and calculus index (14), the presence of bleeding on probing (BOP) (15), attachment loss and pocket depth parameters were recorded as clinical data (13). Patients with a pocket depth of 4 mm and above were diagnosed with periodontitis (16). A mouth mirror and 0.5 mm diameter Williams periodontal probe were used during clinical measurements. When evaluating BOP, the periodontal probe was directed towards the interdental region in terms of the mesial and distal corner parallel to the long axis of the tooth and was moved gently and carefully in the pocket. After examination with the probe, a (+) or (−) value was determined according to the presence of bleeding. The depth of the gingival sulcus/pocket was measured as the distance from the gingival margin to the bottom of the gingival sulcus/pocket. The attachment level was measured as the distance from the cementoenamel junction to the bottom of the probable gingival/periodontal pocket. These parameters were evaluated for all teeth, except the 3rd molar, examined in 6 sites (distofacial, facial, mesiofacial, distolingual, lingual and mesiolingual). Individuals who were pregnant, had diabetes or another systemic problem that would affect their periodontal health, who had received periodontal treatment in the last 6 months, or who took medication that would affect the periodontal condition in the last 6 months, and those who had fewer than 10 teeth in their mouths were not included in the study. After patients' data were recorded, their age, gender, education status, tooth brushing frequency, dental floss use and smoking status were determined. The relation of these parameters to attachment loss, pocket depth, prevalence of periodontal disease and BOP were

determined according to the patient data evaluated.

Statistical Analysis: Continuous data are given as the mean ± standard deviation. Categorical data are given as percentages (%). The Shapiro–Wilk test was used to investigate the suitability of the data for normal distribution. The Mann–Whitney U test was used for comparing the groups that did not conform to normal distribution for the cases with two groups. Kruskal-Wallis H test was used for groups with three or more. Multiple comparisons were made with Dunn's test. IBM SPSS Statistics 21.0 (IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.) program was used for all statistical analyses. For statistical significance, the criterion of a p-value < 0.05 was accepted.

Results

Demographic Characteristics, Oral Hygiene Habits and Smoking Behaviours: The demographic characteristics, oral hygiene habits and smoking behaviours of subjects are shown in Table 1. There were 568 (53.7%) female and 464 (46.3%) male patients in the study. According to the age groups, 641 individuals (60.4%) were aged 18–39, 307 (30.6%) were aged 40–59 and 54 (5.4%) were 60 or over. Educational attainment was relatively high, with 52.4% (n = 525) of the participants reporting that they had graduated from a university. The number of primary school graduates was 149 (14.9%), and the number of high school graduates was 328 (32.7%). More than half of the patients (52.3%) responded that they brush their teeth twice daily, while 356 (35.5%) brushed once daily. Approximately 8.5% of the study group reported that they brushed their teeth occasionally and 3.7% of subjects never brushed. While the number of individuals using dental floss was 162 (16.2%), the number of individuals who did not use it was determined as 840 (83.8%). According to the distribution of smoking status, almost 61.9% were non-smokers, while 15.7% were light smokers and 225 (22.5%) of the patients were heavy smokers.

Periodontal Status and Relationship of Periodontitis With Demographic Characteristics and Behaviours: The association of demographic characteristics, dental and smoking behaviours with periodontitis and BOP is shown in Table 2. Three hundred and eighty-nine patients (38.8%) were diagnosed with periodontitis and the prevalence was significantly higher among males (45%) (p<0.05). In the

distribution of periodontitis incidence by age, the percentage with periodontitis was significantly lower in individuals aged 18–39 (28.4%) compared to individuals aged 60 and over (64.8%) (p< 0.05). According to the information obtained from the patients and clinical data, it was determined that the frequency of periodontitis decreased as the education level increased (p<0.05). There was a statistically significant difference in the prevalence of periodontitis according to oral hygiene behaviours (p<0.05). Periodontitis was diagnosed in 32.8% of those who brushed their teeth twice a day and 62.2% of those who did not brush. With an increase in the use of dental floss, the incidence of periodontitis decreased. While 31.5% of those in the group using dental floss had periodontitis, prevalence was 40.2% in the group that did not use dental floss. There was a statistically significant difference in the prevalence of periodontitis according to smoking behaviour (p<0.05): it increased from 34.5% of non-smokers to 35.7% of light smokers and reached a peak of 52.9% among the heavy smokers (p<0.05). In this study, 73.2% of patients had BOP and males (75.2%) had a higher prevalence of BOP than females (71.4%). The percentage of patients with BOP increased slightly with increasing age, from 71.8% to 81.5%. However, there was no statistically significant difference in BOP between genders, age groups and smoking behaviours. The prevalence of BOP was significantly lower among university graduates and those who used dental floss (p<0.05). There was a higher percentage of people who never brushed their teeth (86.5%) in the BOP group compared to those who brushed twice a day (p<0.05). The relationship of attachment loss and pocket depth with gender and age is described in Table 3. The total mean attachment loss was 1.92±2.18 mm, with males being more affected than females (2.11±2.24 vs 1.76±2.12 mm, p<0.05). Mean attachment loss increased significantly with age (p<0.05). In the youngest age group (18–39 years old), the mean attachment loss was 1.43 ± 2.00 mm and it increased to 2.44±1.97 mm in the oldest age group (≥60 years old). The mean probing depth was 1.90±2.16 mm in the total population, and males (2.20±2.17 mm) were more affected than females (1.64 ± 2.12 mm, p<0.05). The mean probing depth was highest in the ≥ 60-year-old group (2.70±2.11 mm) and increased significantly with age (p<0.05). According to plaque index scoring, it was found that the rate of periodontitis was 33.1% in individuals with plaque score 1, and this rate was

Table 1. Distribution of The Participants According The Demographic Profiles and Behaviors

Profiles	n	Percentage (%)
Gender		
Male	464	46.3
Female	538	53.7
Age (Years)		
18-39	641	64.0
40-59	307	30.6
>60	54	05.4
Education		
Primary	149	14,9
High	328	32.7
University	525	52.4
Smoking behavior		
Non-smoker	620	61.9
Light	157	15.7
Heavy	225	22.5
Frequency of tooth-brushing		
1 time / daily	356	35.5
2 times / daily	524	52.3
Occasionally	85	8.5
Never	37	3.7
Using dental-floss		
Yes / daily	162	16.2
No	840	83.3
Total	1002	100.0

n – Number of subjects

81.3% in individuals with a plaque score 3 (p < 0.05). As in plaque scoring, it was observed that the incidence of periodontitis increased significantly as the calculus score value increased from 0 to 3 in the calculus index scoring results (p < 0.05).

Discussion

Assessment of professional health behaviours within the scope of optimal oral hygiene care is of great importance in terms of preparing preventive and motivational programmes and shaping the health system. Although the aetiology of periodontal diseases is complex, bacterial plaque is the most important causal factor in the pathogenesis of periodontal disease (17). It can be said that it is difficult to evaluate oral health individually due to the influence of many different factors. In addition, oral health practices and habits may change with changes of cultural and social expectations in different sociodemographic situations. First of all, in order to correct poor oral hygiene and prevent periodontal disease, bacterial plaque formation should be reduced by oral hygiene practices (18). Mechanical degradation of the biofilm achieved by tooth brushing and interdental surface cleaning is considered an important strategy to prevent gingivitis and the subsequent periodontitis (19). The findings of our study support the results of previous studies it was determined that the incidence of periodontitis and BOP decreased with an increase of tooth brushing frequency and the use of dental floss (20).

Previous studies revealed that gingivitis and periodontitis are more common and more severe in smokers than non-smokers (21). The reason for this may be that smokers pay less attention to oral health practices than non-smokers and, consequently, plaque formation is more common among smokers and they are more prone to periodontal disease. In addition, the negative effects of smoking on the periodontium can be considered as another reason for increased pocket formation and attachment loss due to periodontal disease in smokers. Researchers have reported a difference in periodontal pocket depth between smokers and non-smokers (10). In our study, the mean attachment loss and pocket depth in heavy smokers were higher than in light smokers and non-smokers. The presented results showed that smoking is one of the factors affecting periodontal

Table 2. Relationship of periodontitis and bleeding on probing with demographic characteristics and behaviors

Profiles	Periodontitis n (%)		χ2	P-value	BOP n (%)		χ2	P-value
	Non	Periodontitis			Non	Bleeding		
Gender	255 (55.0)	209 (45)	14,08	<0.001*	115 (24.8)	349 (75.2)	1.871	0.171
Male								
Female	358 (66.5)	180 (33.5)			154 (28.6)	384 (71.4)		
Age (Years)								
18-39	459 (71.6)	182 (28.4)			181 (28.2)	460 (71.8)		
40-59	135 (44.0)	172 (56.0)	82,973	<0.001*	78 (25.4)	229 (74.6)	2.862	0.239
≥60	19 (35.2)	35 (64.8)			10 (18.5)	44 (81.5)		
Education								
Primary	63 (42.3)	86 (57.7)			36 (24.2)	113 (75.8)		
High	182 (55.5)	146 (44.5)	44,449	<0.001*	77 (23.5)	251 (76.5)	44.449	<0.001*
University	368 (70.1)	157 (29.9)			156 (29.7)	369 (70.3)		
Smoking behavior								
Non-smoker	406 (65.5)	214 (34.5)			173 (27.9)	447 (72.1)		
Light	101 (64.3)	56 (35.7)	24,243	<0.001*	40 (25.5)	117 (74.5)	.941	0.624
Heavy	106 (47.1)	119 (52.9)			56 (24.9)	169 (75.1)		
Frequency of tooth-brushing								
1 time / daily	206 (57.9)	150 (42.1)			103 (28.9)	253 (71.1)		
2 times / daily	352 (67.2)	172 (32.8)			150 (28.6)	374 (71.4)		
Occasionally	41 (48.2)	44 (51.8)	24,063	<0.001*	11 (12.9)	74 (87.1)	13.352	0.004*
Never	14 (37.8)	23 (62.2)			5 (13.5)	32 (86.5)		
Using dental-floss								
Yes / daily	111 (68.5)	51 (31.5)			60 (37)	102 (63)		
Never	338 (40.2)	502 (59.8)	4,385	0,036*	209 (24.9)	631 (75.1)	10.219	0.001*

Chi-squared test; *P<0.05 – Significant. P – Probability value; n – Number of subjects; χ2 – Chi-square value; BOP Bleeding on probing

health, determined by the statistical difference between the groups evaluated.

In many studies, it has been reported that the risk of periodontal disease increases with age and, parallel to this, pocket depth and attachment loss increased (22). There are many different reasons why oral hygiene in the elderly is not as adequate as in the young. Primarily, elderly individuals have significant loss of manipulation ability due to a decrease in cognitive functions (thinking, understanding, comprehension) and increase in

Table 3. Relationship of Attachment Loss and Pocket Depth With Gender and Age

Profiles	n	Attachment Loss mm			Probing Depth mm		
		min-max	mean ± SD	P-value	min-max	mean ± SD	P-value
Gender							
Male	538	0 - 13	2.11 ± 2.24	0.012*	1 - 13	2.20 ± 2.17	<0.001*
Female	464	0 - 9	1.76 ± 2.12		1 - 11	1.64 ± 2.12	
Age (Years)							
18-39	641	0 - 9	1.43 ± 2.00 [a,b]		1 - 10	1.47 ± 1.96 [a,b]	
40-59	307	0 - 12	2.86 ± 2.25 [a]	<0.001**	1 - 13	2.67 ± 2.30 [a]	<0.001**
≥60	54	0 - 13	2.44 ± 1.97 [b]		1 - 13	2.70 ± 2.11 [b]	
Total	1002	0 - 13	1.92 ± 2.18		1 - 13	1.90 ± 2.16	

Mann-Whitney U Test *; Kruskal-Wallis test **; and post-hoc test (Dunn) a 18-39 age group compared with40-59 age group; b 18-39 age group compared with ≥60 age group; *, **, a, b; P<0.05 – Significant P-Probability value; n – Number of subjects; SD – Standard deviation; Min – Minimum; max - Maximum

existing systemic diseases (23). Therefore, they may not be able to easily apply oral hygiene procedures. In addition, as the periodontal tissues are exposed to plaque with advancing age, deficiencies in the host's defence against plaque microorganisms may occur due to a decrease in immune system function, and this situation prepares a suitable ground for periodontal disease. It has been reported that older people – especially individuals with lower socioeconomic status experience more tooth loss due to increased periodontal disease because they do not get enough oral health services (24). In our study, the prevalence of periodontitis, and mean pocket depth and attachment loss were significantly higher in individuals aged 60 and over compared to individuals aged 18–39. There are many epidemiological studies supporting our findings which evaluated the relationship of periodontal health with age, but there are also studies showing different results (25-27). These differences may arise from the use of different review methods and instrumentation or interpretation of the findings.

Many factors affecting periodontal health have been evaluated and analysed to date. One of these factors is educational situation, which is seen as representative and a predictor of socioeconomic situation (24). From the findings of our study, it was determined that as the education level increased, oral hygiene practices increased, and the prevalence of periodontal disease decreased. Geyer et al. examined the effects of education and

income on oral health and they showed that education and income affect oral health independently of each other (28). In another study, in the US, it was found that education had an effect on the extent of gingival bleeding, loss of periodontal attachment (≥ 3 mm) and the ratio of sites with periodontal pockets ≥ 4 mm (29). Education is the use of information for the benefit of an individual which contributes to their personal development in all areas. Education also gives people the ability to manage their own lives without being dependent on others and to produce solutions against problems. Therefore, it may be a matter of having insufficient knowledge about the importance of oral health due to low education level and not being able to fully adopt and apply oral hygiene practices.

According to our findings, it was shown that the prevalence of periodontitis and the mean attachment loss and probing depth were higher in males than females. The relationship between gender and periodontal disease has been examined in many studies. Grossi et al. reported that men had approximately 50% more prevalence of periodontitis and had higher periodontal destruction compared to the female population (30). In another study, it was presented that males were clearly more likely (3.7 to 1) to have generalized juvenile periodontitis and had a higher risk of attachment loss than females, even when other variables were statistically controlled (31). These findings can be explained by the fact that females are more careful about oral and dental

health and pay more attention to oral hygiene. It is believed that the prevalence and severity of periodontal disease is associated with more careful oral hygiene habits rather than genetic factors (32).

Within the limitations of this study, it can be concluded that demographic characteristics and smoking and dental behaviours are associated with periodontal health. Improving sociodemograhic status, preventive education and therapeutic services can be a way to improve oral health. Proposing the necessary measures for good oral hygiene as well as preparing motivational programmes can help provide adequate incentives to implement them.

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References

1. Demmer RT, Papapanou PN. Epidemiologic patterns of chronic and aggressive periodontitis. Periodontol 2000 2010; 53: 28-44.

2. Lang, Niklaus P., Marc A. Schätzle, and Harald Löe. "Gingivitis as a risk factor in periodontal disease." Journal of clinical periodontology 36 (2009): 3-8.

3. Bollen CM, Papaioanno W, Van Eldere J, Schepers E, Quirynen M, van Steenberghe D. The influence of abutment surface roughness on plaque accumulation and peri-implant mucositis. Clin Oral Implants Res 1996; 7: 201-211.

4. Reynolds, Mark A. "Modifiable risk factors in periodontitis: at the intersection of aging and disease." Periodontology 2000 64.1 (2014): 7-19.

5. Al-Shammari KF, Al-Khabbaz AK, Al-Ansari JM, Neiva R, Wang HL. Risk indicators for tooth loss due to periodontal disease. J Periodontol 2005; 76: 1910-1918.

6. Jonsson B, Ohrn K. Evaluation of the effect of non-surgical periodontal treatment on oral health-related quality of life: estimation of minimal important differences 1 year after treatment. J Clin Periodontol 2014; 41: 275-282.

7. Eickholz P, Kaltschmitt J, Berbig J, Reitmeir P, Pretzl B. Tooth loss after active periodontal therapy. 1: patient-related factors for risk, prognosis, and quality of outcome. J Clin Periodontol 2008; 35: 165-174.

8. Ng, Sam KS, and W. Keung Leung. "Oral health‐related quality of life and periodontal status." Community dentistry and oral epidemiology 34.2 (2006): 114-122.

9. Christensen LB, Petersen PE, Krustrup U, Kjoller M. Self-reported oral hygiene practices among adults in Denmark. Community Dent Health 2003; 20: 229-235.

10. Akpinar A, Toker H, Calisir M. Periodontoloji kliniğine başvuran hastalarda periodontal durum ve sistemik hastalıkların değerlendirilmesi. Cumhuriyet Dent J 2012; 15: 93-100.

11. Gokalp S, Dogan BG, Tekcicek M, Berberoglu A, Unluer S. The oral health profile of adults and elderly, Turkey-2004. J Hacettepe Faculty Dentistry 2007; 31: 11-18.

12. Hou, R., Mi, Y., Xu, Q., Wu, F., Ma, Y., Xue, P., ... & Yang, W. (2014). Oral health survey and oral health questionnaire for high school students in Tibet, China. Head & face medicine, 10(1), 1-6.

13. Loe H. The Gingival Index, the Plaque Index and the Retention Index Systems. J Periodontol 1967; 38: 610-616.

14. Mandel, I. D., & Gaffar, A. (1986). Calculus revisited: a review. Journal of clinical periodontology, 13(4), 249-257.

15. Joss, Andreas, Rolf Adler, and Niklaus P. Lang. "Bleeding on probing. A parameter for monitoring periodontal conditions in clinical practice." Journal of clinical periodontology 21.6 (1994): 402-408.

16. Eke PI, Page RC, Wei L, Thornton-Evans G, Genco RJ. Update of the case definitions for population-based surveillance of periodontitis. J Periodontol. 2012;83:1449–1454.

17. Górska R, Górski B. Self-reported oral status and habits related to oral care in adult Poles: A questionnaire study. Dental and medical problems 2018; 55: 313-320.

18. Paul B, Basu M, Dutta S, Chattopadhyay S, Sinha D, Misra R. Awareness and practices of oral hygiene and its relation to sociodemographic factors among patients attending the general outpatient department in a tertiary care hospital of Kolkata, India. Journal of family medicine and primary care 2014; 3: 107.

19. Jepsen S, Blanco J, Buchalla W, Carvalho JC, Dietrich T, Dörfer C, et al. Prevention and control of dental caries and periodontal diseases at individual and population level: consensus report of group 3 of joint EFP/ORCA workshop on the boundaries

between caries and periodontal diseases. J Clin Periodontol 2017; 44: 85-93.

20. Berchier, C. E., Slot, D. E., Haps, S., & Van der Weijden, G. A. (2008). The efficacy of dental floss in addition to a toothbrush on plaque and parameters of gingival inflammation: a systematic review. International journal of dental hygiene, 6(4), 265-279.

21. Johnson GK, Poore TK, Payne JB, Organ CC. Effect of smokeless tobacco extract on human gingival keratinocyte levels of prostaglandin E2 and interleukin-1. J Periodontol 1996; 67: 116-124.

22. Borrell LN, Crawford ND. Socioeconomic position indicators and periodontitis: examining the evidence. Periodontology 2000 2012; 58: 69-83.

23. Evren, B. A., Uludamar, A., Işeri, U., & Ozkan, Y. K. (2011). The association between socioeconomic status, oral hygiene practice, denture stomatitis and oral status in elderly people living different residential homes. Archives of gerontology and geriatrics, 53(3), 252-257.

24. Heredia-Ponce E, Irigoyen-Camacho ME, Sánchez-García S. Oral health status of institutionalized older women from different socioeconomic positions. J Health Care Poor Underserved 2017; 28: 1462-1476.

25. Albandar JM, Brunelle JA, Kingman A. Destructive periodontal disease in adults 30 years of age and older in the United States, 1988-1994. J Periodontol 1999; 70: 13-29.

26. Burt BA. Periodontitis and aging: reviewing recent evidence. J Am Dent Assoc 1994; 125: 273-279.

27. Papapanou PN. Risk assessments in the diagnosis and treatment of periodontal diseases. J Dent Educ 1998; 62: 822-839.

28. Geyer S, Schneller T, Micheelis W. Social gradients and cumulative effects of income and education on dental health in the Fourth German Oral Health Study. Community Dent Oral Epidemiol 2010; 38: 120-128.

29. Sabbah W, Tsakos G, Chandola T, Sheiham A, Watt RG. Social Gradients in Oral and General Health. J Dent Res 2007; 86: 992–996.

30. Grossi SG, Genco RJ, Machte EE. Assessment of risk for periodontal disease. II. Risk indicators for alveolar bone loss. J Periodontol 1995; 66: 23–29.

31. Löe H, Brown LJ. Early onset periodontitis in the United States of America. J Periodontol 1991; 62: 608-616.

32. Madden IM, Stock CA, Holt RD, Bidinger PD, Newman HN. Oral health status and access to care in a rural area of India. J Int Acad Periodontol 2000; 2: 110-114.