International Journal of Public Health Science (IJPHS)
Vol. 11, No. 2, June 2022, pp. 377~383
ISSN: 2252-8806, DOI: 10.11591/ijphs.v11i2.21181

Periodontal health status in patients with periodontal disease: A descriptive study among Emirati population

Danavanthi Bangera[1], Krishnan Viswanathan[2], Jayadevan Sreedharan[3], Prabhu Natarajan[4]
[1]Department of General Dentistry, Dental Surgeon and Acting Medical Director, Thumbay Dental Hospital, Gulf Medical University, Ajman, UAE
[2]Department of Periodontics, Professor of Periodontology, Annamalai University, Tamil Nadu, India
[3]Department of Community Medicine, Professor of Epidemiology and Biostatistics, College of Medicine, Gulf Medical University, Ajman, UAE
[4]Department of Periodontics, Faculty in Periodontics, University of Science and Technology of Fujairah, Fujairah, UAE

Article Info

Article history:

Received June 22, 2021
Revised Dec 13, 2021
Accepted Jan 26, 2022

Keywords:

Clinical attachment loss
Diabetes mellitus
Periodontal disease
UAE

ABSTRACT

Globally, around 10-15% of adults aged 21 to 50 years and around 30% of the elderly are diagnosed with severe periodontitis. About 20-50% of the population is affected with periodontal disease. However, there is a lack of actual national data in the UAE on oral health and periodontal health status. To determine the periodontal health status among the Emirati population aged 18 to 65 years. Periodontal health status of the patients with periodontitis was assessed by measuring plaque index; gingival index, clinical attachment loss (CAL) and community periodontal index treatment need (CPITN). All collected data were processed descriptively by presenting in numbers and percentages and analytically by cross-tabulation between variables. The majority of the patients (84%) had a mild level of clinical attachment loss and 54% had probing pocket depth of 3.5-5.5 mm. Moderate loss of clinical attachment was observed in 30.8% of patients with a medical history of diabetes mellitus and hypertension and 10.8% with no medical history. Most of the patients need non-surgical periodontal treatment that is scaling and root planning along with oral hygiene instructions and maintenance to reduce the progression of periodontal diseases.

Corresponding Author:

Danavanthi Bangera
Department of General Dentistry, Dental Surgeon and Acting Medical Director, Thumbay Dental Hospital, Gulf Medical University
Ajman, UAE
Email ID: dhansbang@gmail.com

1. INTRODUCTION

Periodontal disease is a silent devastating disease and patients usually ignore this disease at first as early symptoms are less concerning. It is an inflammatory condition involving the destruction of periodontal apparatus, cementum, collagen fibrils on the root surface of the tooth and a layer of calcified interfibrillar matrix [1]. Classical signs are redness and swelling in the gingiva with loss of supporting tissue surrounding the tooth. Clinically, the disease can be measured by plaque index, gingival index, clinical attachment loss (CAL) and periodontal pocket depth [2]–[4].

Globally, around 10-15% of adults in the age group of 21 to 50 years and around 30% of the elderly population are diagnosed with severe periodontitis [5], [6]. Globally, about 20 to 50% of the population is affected with periodontal disease [7]. Developing countries showed a higher prevalence of 35 to 70% of calculus and bleeding index among adolescents compared to 4 to 34% in developed countries. Around 14%

to 47% of adult populations showed calculus deposits in developed countries compared to 36 to 63% in developing countries. However, the prevalence of periodontal pockets of 4-5 mm was higher among the adult population in developed countries. Periodontal pockets of 6 mm or above were found in greater proportion in the elderly population in both developed and developing countries [8].

In a study conducted among adults, shallow pockets were observed among 37.4% in Saudi Arabia, 41.2% in Iraq and deep pockets were observed among 22.6% of individuals. In Yemen, deep pockets were observed in 12.5% of adults, while in the Moroccan study, shallow pockets were reported among 54.6% and deep pockets among 28.6%. In Jordan, about 18.6% were observed to have shallow pockets and 11.1% deep pockets. While in the UAE, shallow pockets were prevalent from 0 to 53% and deep pockets from 0% to 34% [9]. There is a lack of actual national data in the UAE on oral health and periodontal health status; however, it might reasonably be higher in the UAE as there is a low percentage of the population seeking dental care [10]. As per Dubai health authority (DHA), only 20% of the population seek treatment for periodontitis in 2016 [11]. Oral health status was poor, with a need for immediate dental care in care home residents in the UAE [12].

Due to the high prevalence of diabetes among patients in the UAE with periodontal disease, there is a need for action both at the local and national levels in the UAE to address these challenges. Diabetic patients with clinical attachment loss are reported to have a significant impact on oral health-related quality of life [13]. This research study has proposed to measure the clinical parameters of the periodontal supporting structures among the local population in the UAE diagnosed with periodontitis. The results of the study will greatly contribute to national data of the health care system and provide the baseline for further, more extensive research study. This paper aims to determine the periodontal health status among the Emirati population aged 18 to 65 years.

2. RESEARCH METHOD

This paper is part of the larger research study conducted on periodontal disease and diabetes mellitus among the UAE population. Fifty patients with periodontal disease visiting Thumbay Dental Hospital with the age group of 18 to 65 years were included those were willing to participate and had no history of periodontal therapy in the last six months. Both the genders with UAE nationality were included. Complete edentulous patients or patients with full mouth implant placement were excluded from the study.

Ethical approval was obtained for a larger research study from the Institutional review board (IRB) committee of Gulf Medical University, Ajman, UAE. Written consent was obtained prior to the administration of the questionnaire. Personal identification details were not included in the questionnaire, thus maintaining anonymity.

An interviewer-administered structured questionnaire was used to collect data on demographic variables, smoking habits and medical history after obtaining informed consent from the participants. Periodontal health status was assessed by measuring plaque index, gingival index, CAL and community periodontal index treatment needs (CPITN). All the examinations were carried out by trained dental practitioners, who examined each person seated on the dental chair under adequate light, using a WHO probe, dental mirror and explorer.

Plaque index (PI): Plaque Index by Silness-Löe was measured on six teeth; 16, 12, 24, 36, 32, 44. The plaque index score for an individual tooth was calculated with the following scores and criteria: 0- excellent, 0.1-0.9- good, 1.0-1.9- fair, 2.0-3.0- poor

Gingival index (GI): Gingival index (GI) by Loe and Silness was performed by gentle probing of the gingival crevice [14], [15]. GI will be measured on six Index teeth, i.e., 16, 12, 24, 36, 32, 44. For each of these teeth, scores are given for each side of the tooth. The interpretation of index is as follows: 0.1-1.0- mild inflammation, 1.1-2.0- moderate inflammation, 2.1-3.0- severe inflammation.

CAL: CAL was calculated from measurements made from cement-enamel junction (CEJ) to the base of the periodontal pocket. The mean value of clinical attachment loss was obtained and divided into four groups: a clinical attachment of <1 mm (normal group), a clinical attachment of 1-3 mm (mild group), a clinical attachment of 3-5 mm (moderate group) and a clinical attachment of ≥5 mm (severe group) [16].

In CPITN index, all teeth were examined from all four quadrants. Each tooth was checked for the pocket depth, detection of calculus, and bleeding response [17], [18]. The examination was performed on all surfaces of the tooth and the scoring code criteria were as follows: 0=healthy; 1=bleeding on probing; 2=supra or subgingival calculus; 3=there is a pocket with a depth of 3.5–5.5 mm; 4=there is a pocket with a depth of more than 5.5 mm [19], [20].

Treatment needs were categorized as follows:

0=no treatment (Code 0);

1=Basic oral hygiene instruction (OHI) (Code 1);

2=OHI+ scaling (Codes 2);
3=OHI, full periodontal assessment, non-surgical periodontal treatment (SRP) (Code 3);
4=OHI, full periodontal assessment, SRP, surgical intervention (Code 4)

After completion of the data collection, data was fed into Excel spreadsheet. SPSS version 22 was used for analysis. All collected data were processed descriptively by presenting in numbers and percentages and analytically by cross-tabulation between variables.

3. RESULTS AND DISCUSSION

A total of 50 patients participated in the study (24 males and 26 females). Age groups were divided as ≤30 years old, 30-40 years old, 40-50 years old and ≥50 years old. The majority of them were working in administration (38%) and the rest were housewives, students and others include businessmen and retired as shown in Table 1.

Table 1. Socio-demographic distribution of participants (n=50)

Socio-demographic characteristics	Groups	No.	%
Age groups (in years)	≤ 30	12	24.0
	30-40	13	26.0
	40-50	13	26.0
	≥ 50	12	24.0
Gender	Male	24	48.0
	Female	26	52.0
Education	<Graduate	20	40.0
	≥Graduate	30	60.0
Occupation	Administration	19	38.0
	Student	6	12.0
	Housewife	16	32.0
	Others	9	18.0

Around 16% of the population use tobacco which includes 8% of cigarettes, 6% of shisha and 2% of dokha. Among current cigarette users, most of them smoke over 10-12 times per day and around 50% of them started smoking at the age of 20 years and a few of them started shisha occasionally at the age of 20-25 years of age. Among 26% gives a positive medical history of diabetes mellitus, hypertension, cardiovascular diseases and rheumatoid arthritis. The majority of them are hypertensive and around 53.8% are diabetic. All Patients with diabetes mellitus are regular with their medications and follow up with doctors since the last 5-10 years.

The majority (96%) of patients with periodontitis provide a positive history of a dental visit. However, of which 72% don't visit the dentist regularly. Most of them (62%) had visited a dentist over one year back, 22% between six months to one year and 12% less than six months. About 36% of them visited dentists for restorations, 20% for root canal treatment, 16% for scaling and polishing, 10% for crowns and bridges and 14% for other general dental treatments. About 38% of the population is aware of their gum disease, but only 20% have undergone scaling and polishing as a treatment for gum disease over one year back. About 54% were diagnosed with Code 3 of CPITN, indicating a treatment plan of full periodontal assessment, Non-surgical periodontal treatment, scaling and root planning (SRP) and basic oral hygiene instructions as shown in Table 2.

Association of sociodemographic characteristics with plaque index level is described in Table 3. Majority of the patients were observed with fair oral hygiene. Poor plaque index level was reported more among older patients and those who were using tobacco. Table 4 describes that about 15.8% of patients with a positive medical history of diabetes mellitus, hypertension and cardiovascular disease were diagnosed with severe gingivitis compared to those with no medical history.

Cross-tabulation of CAL level with sociodemographic variables is described in Table 5. Mild level of CAL was observed more among younger age group of female patients. Corss-tabulation of CPITN with sociodemographic variables is described in Table 6. Older age group patients were assessed more with Code 3. Patients with history of tobacco use also were assessed with more Code 3.

In this study, the prevalence of fair level of plaque index, moderate gingivitis and clinical attachment loss was distributed equally in all age groups; this may attribute to a small sample size. However, a higher percentage of patients over 50 years of age were observed to have poor oral hygiene (25%), severe gingivitis (16.7%), moderate level of CAL (33.3%) and pocket depth >5 mm (18.2%). This is in line with previous studies which reported that the severity of the periodontal health status increases with age due to the cumulative effect of disease over a period of time [21]–[23]. A study conducted in Saudi Arabia showed that

it is not the age but the period of plaque accumulation in the periodontal tissue that leads to an increase in disease prevalence [24].

Table 2. Distribution of scoring level of plaque index, gingival index, CAL, and CPITN

S.No.	Index	Level	Number	Percentage
1	Plaque Index	Good	1	2
		Fair	42	84
		Poor	7	14
2	Gingival Index	Mild	1	2
		Moderate	43	86
		Severe	6	12
3	CAL	Normal	--	--
		Mild	42	84.0
		Moderate	8	16.0
		Severe	--	--
4	CPITN	Code 0 (Normal healthy gingiva)	--	--
		Code 1 (Bleeding after probing)	1	2.0
		Code 2 (Presence of calculus)	16	32.0
		Code 3 (Probing depth 3.5-5.5 mm)	27	54.0
		Code 4 (Probing depth >5.5 mm)	6	12.0
5	Treatment plan	1-Basic oral hygiene instruction	1	2.0
		2-OHI, scaling & polishing	16	32.0
		3-OHI, full periodontal assessment, non-surgical periodontal treatment (SRP)	27	54.0
		4-OHI, full periodontal assessment, SRP, surgical intervention	6	12.0

Table 3. Cross-tabulation of plaque index level with independent variables

Variable	Group	Plaque index level						Total
		Good		Fair		Poor		
		No.	%	No.	%	No.	%	
Age	<=30	--	--	10	83.3	2	16.7	12
	30-40	--	--	12	92.3	1	7.7	13
	40-50	--	--	12	92.3	1	7.7	13
	>50	1	8.3	8	66.7	3	25.0	12
Gender	Male	--	--	19	79.2	5	20.8	24
	Female	1	3.8	23	88.5	2	7.7	26
Education	<Graduate	--	--	18	90.0	2	10.0	20
	>=Gradate	1	3.3	24	80.0	5	16.7	30
Use of tobacco	No	1	2.4	36	85.7	5	11.9	42
	Yes	--	--	6	75.0	2	25.0	8
Medical history	No	--	--	33	89.2	4	10.8	37
	Yes	1	7.7	9	69.2	3	23.1	13

Table 4. Cross-tabulation of gingival index level with independent variables

Variable	Group	Gingival index level						Total
		Mild		Moderate		Severe		
		No.	%	No.	%	No.	%	
Age	<=30	1	8.3	10	83.3	1	8.3	12
	30-40	--	--	12	92.3	1	7.7	13
	40-50	--	--	11	84.6	2	15.4	13
	>50	--	--	10	83.3	2	16.7	12
Gender	Male	1	4.2	19	79.2	4	16.7	24
	Female	--	--	24	92.3	2	7.7	26
Education	<Graduate	--	--	18	90.0	2	10.0	20
	>=Gradate	1	3.3	25	83.3	4	13.3	30
Use of tobacco	No	1	2.4	38	90.5	3	7.1	42
	Yes	--	--	5	62.5	3	37.5	8
Medical history	No	1	2.7	32	86.5	4	10.8	37
	Yes	--	--	11	84.6	2	15.4	13

Plaque index has a significant effect on periodontal health. In this study, the majority of the patients had fair level of plaque index (84%). This result reflected fair knowledge of oral hygiene maintenance practices with a good level of patients' dental visits. A similar study conducted in Indonesia showed 66% of fair levels of oral hygiene [18]. With respect to gender, male comparatively has poor oral hygiene (20.8%), severe gingivitis (16.7%), and a moderate level of CAL (25%) and pocket depth >5 mm (17.5%) as compared to females. This may reflect a lack of awareness of oral hygiene importance among males compared to females [25] and most male patients had a history of tobacco use.

Table 5. Cross-tabulation of the level of clinical attachment loss with independent variables

Variable	Group	CAL level				Total
		Mild		Moderate		
		No.	%	No.	%	
Age	<=30	11	91.7	1	8.3	12
	30-40	12	92.3	1	7.7	13
	40-50	11	84.6	2	15.4	13
	>50	8	66.7	4	33.3	12
Gender	Male	18	75.0	6	25.0	24
	Female	24	92.3	2	7.7	26
Education	<Graduate	18	90.0	2	10.0	20
	>=Gradate	24	80.0	6	20.0	30
Use of tobacco	No	37	88.1	5	11.9	42
	Yes	5	62.5	3	37.5	8
Medical history	No	33	89.2	4	10.8	37
	Yes	9	69.2	4	30.8	13

Table 6. Includes the cross-tabulation of CPITN with independent variables

Variable	Group	CPITN								Total
		Code 1*		Code 2*		Code 3*		Code 4*		
		No.	%	No.	%	No.	%	No.	%	
Age	<=30	--	--	4	33.3	7	58.3	1	8.3	12
	30-40	1	7.7	5	38.5	7	53.8	--	--	13
	40-50	--	--	6	46.2	5	38.5	2	15.4	13
	>50	--	--	1	9.1	8	72.7	2	18.2	11
Gender	Male	1	4.3	5	21.7	13	56.5	4	17.4	23
	Female	--	--	11	42.3	14	53.8	1	3.8	26
Education	<Graduate	--	--	6	30.0	13	65.0	1	5.0	20
	>=Gradate	1	3.4	10	34.5	14	48.3	4	13.8	29
Use of tobacco	No	1	2.4	14	33.3	23	54.8	4	9.5	42
	Yes	--	--	2	28.6	4	57.1	1	14.3	7
Medical history	No	1	2.8	13	36.1	20	55.6	2	5.6	36
	Yes	--	--	3	23.1	7	53.8	3	23.1	13

*---Code 1-Bleeding after probing, Code 2-Presence of supragingival and subgingival calculus, Code 3-Pocket depth between 3.5 mm-5.5 mm, Code 4- Pocket depth >5.5 mm

Smoking and diabetes mellitus are important risk factors for the severity of periodontal disease [26]. Around 16% of the patients had a history of tobacco use and 53.8% out of 13 patients with positive medical history were diabetic. This high percentage maybe because of the small sample size. However, 18.7% of the prevalence of diabetes was reported in the UAE, followed by Saudi Arabia (16.8%), Bahrain (15.4%), Kuwait (14.6%) and Oman (13.4%) [27]. Severe gingivitis (15.4%), increased loss of clinical attachment (30.8%) and pocket depth >5 mm (23.1%) are observed in the patients with diabetes in the present study. A systematic review conducted on the epidemiologic relationship between periodontitis and diabetes mellitus type 2 concluded that periodontitis and diabetes mellitus type 2 had strong connections indicating of bidirectional relationship [28], [29]. Studies have shown that a decrease in the prevalence of periodontitis lowers the prevalence of systemic disease and its associated complications [30], [31]. In the UAE, a high prevalence of diabetes was reported among patients with periodontal disease [32], [33].

In the present study, around 16% of males have been reported to have tobacco use. This is in line with the pilot study conducted in the UAE, where male nationals have been reported to have a smoking prevalence of 24% compared to females (0.8%) [34]. In this study, most of the patients with tobacco use had 62.5% of mild clinical attachment loss and 57.1% of the pocket depth of 3.5 to 5.5 mm. Similar results were obtained in the comparative study conducted on CAL and periodontal health status, where the majority of smokers (31%) had mild clinical attachment loss and pocket depth 4 to 5 mm (41%) [35]. Limitations of the study were the small sample size and the study was limited to the patients with periodontitis visiting Thumbay Dental Hospital. However, to the best of the author's knowledge, this is the first such study among the Emirati population in the UAE.

4. CONCLUSION

The study concluded that the majority of the patients (84%) had a mild level of clinical attachment loss and 54% had probing pocket depth of 3.5-5.5 mm. Moderate loss of clinical attachment was observed in 30.8% of patients with a medical history of diabetes mellitus and hypertension. So most of the patients need non-surgical periodontal treatment that is scaling and root planning along with oral hygiene instructions and maintenance to reduce the progression of periodontal diseases.

REFERENCES

[1] Centers for Disease Control and Prevention, "Periodontal Disease," *Division of Oral Health, National Center for Chronic Disease Prevention and Health Promotion*, 2013. https://www.cdc.gov/oralhealth/conditions/periodontal-disease.html.

[2] A. M, "Periodontal conditions and treatment outcomes for subjects with Diabetes Mellitus: special emphasis on HbA1C levels and T- cells," Karolinska Institute, Stockholm, 2016.

[3] M. G. Newman, H. H. Takei, P. R. Klokkevold, and F. A. Carranza, "Classification of diseases and conditions affecting the periodontium," in *Carranza's Clinical Periodontology*, 11th ed., Elsevier, 2012, p. xvi.

[4] R. Nocini, G. Lippi, and C. Mattiuzzi, "Periodontal disease: the portrait of an epidemic," *Journal of Public Health and Emergency*, vol. 4, p. 10, Jun. 2020, doi: 10.21037/jphe.2020.03.01.

[5] W. J. Teeuw, V. E. A. Gerdes, and B. G. Loos, "Effect of periodontal treatment on glycemic control of diabetic patients," *Diabetes Care*, vol. 33, no. 2, pp. 421–427, Feb. 2010, doi: 10.2337/dc09-1378.

[6] P. I. Eke *et al.*, "Update on prevalence of periodontitis in adults in the United States: NHANES 2009 to 2012," *Journal of Periodontology*, vol. 86, no. 5, pp. 611–622, May 2015, doi: 10.1902/jop.2015.140520.

[7] M. Sanz, "European workshop in periodontal health and cardiovascular disease," *European Heart Journal Supplements*, vol. 12, no. Suppl B, pp. B2–B2, Apr. 2010, doi: 10.1093/eurheartj/suq002.

[8] N. MA, "Prevalence of periodontal disease, its association with systemic diseases and prevention," *International Journal of Health Science*, vol. 11, no. 2, pp. 72–80, 2017.

[9] L. S. Al-Harthi, M. P. Cullinan, J. W. Leichter, and W. M. Thomson, "Periodontitis among adult populations in the Arab World," *International Dental Journal*, vol. 63, no. 1, pp. 7–11, Feb. 2013, doi: 10.1111/idj.12002.

[10] K. Al Bloushi, "Diabetes mellitus and periodontal disease in the United Arab Emirates," *International Dental Journal*, vol. 58, pp. S248--S251, Aug. 2008, doi: 10.1111/j.1875-595x.2008.tb00205.x.

[11] E. Abu-Gharbieh, B. Saddik, M. El-Faramawi, S. Hamidi, and M. Basheti, "Oral health knowledge and behavior among adults in the United Arab Emirates," *BioMed Research International*, vol. 2019, pp. 1–7, Feb. 2019, doi: 10.1155/2019/7568679.

[12] A. mazrooei B, A. R. F, and M. A, "The oral health status of attendees and residents in United Arab Emirates care homes," *Journal International Society Preventive Community Dentistry*, vol. 10, no. 1, pp. 101–106, 2020.

[13] N. Khalifa, B. Rahman, M. D. Gaintantzopoulou, S. Al-Amad, and M. M. Awad, "Oral health status and oral health-related quality of life among patients with type 2 diabetes mellitus in the United Arab Emirates: a matched case-control study," *Health and Quality of Life Outcomes*, vol. 18, no. 1, Jun. 2020, doi: 10.1186/s12955-020-01418-9.

[14] S. Poulsen and Odont, "Epidemiology and indices of gingival and periodontal disease," *The American Academy of Pedodontics*, vol. 3, no. Special Issue, Sep. 1981.

[15] S. Slawik *et al.*, "Probiotics affect the clinical inflammatory parameters of experimental gingivitis in humans," *European Journal of Clinical Nutrition*, vol. 65, no. 7, pp. 857–863, Jul. 2011, doi: 10.1038/ejcn.2011.45.

[16] G.-B. Rheu *et al.*, "Risk assessment for clinical attachment loss of periodontal tissue in Korean adults," *The Journal of Advanced Prosthodontics*, vol. 3, no. 1, p. 25, 2011, doi: 10.4047/jap.2011.3.1.25.

[17] T. Dietrich *et al.*, "Periodontal diagnosis in the context of the 2017 classification system of periodontal diseases and conditions implementation in clinical practice," *British Dental Journal*, vol. 226, no. 1, pp. 16–22, Jan. 2019, doi: 10.1038/sj.bdj.2019.3.

[18] A. Susanto, D. Carolina, A. Amaliya, I. S. Pribadi, and A. Miranda, "Periodontal health status and treatment needs of the community in Indonesia: A cross sectional study," *Journal of International Oral Health*, vol. 12, no. 2, p. 114, 2020, doi: 10.4103/jioh.jioh_167_19.

[19] World Health Organization, "Oral Health. World Health Organization," *Geneva, Switzerland*, 2013. https://capp.mau.se/methods-%0Aand-indices/.

[20] E. D. Beltrán-Aguilar, P. I. Eke, G. Thornton-Evans, and P. E. Petersen, "Recording and surveillance systems for periodontal diseases," *Periodontology 2000*, vol. 60, no. 1, pp. 40–53, Oct. 2012, doi: 10.1111/j.1600-0757.2012.00446.x.

[21] M. Bansal, N. Mittal, and T. Singh, "Assessment of the prevalence of periodontal diseases and treatment needs: A hospital-based study," *Journal of Indian Society of Periodontology*, vol. 19, no. 2, p. 211, 2015, doi: 10.4103/0972-124x.145810.

[22] C. Marya, V. Kumar, M. Khatri, V. Agarwal, G. Singh, and G. Gupta, "Prevalence of periodontal diseases in India," *Journal of Oral Health and Community Dentistry*, vol. 4, no. Spl, pp. 7–16, 2010, doi: 10.5005/johcd-4-Spl-7.

[23] F. M. Tadjoedin, A. H. Fitri, S. O. Kuswandani, S. Benso, and Y. Soeros, "The correlation between age and periodontal diseases," *Journal of International Dental and Medical Research*, vol. 10, no. 2, pp. 327–332, 2017.

[24] O. A. I. Mugeiren, "Assessment of periodontal status among the outpatients attending private university dental clinics in Riyadh city, Saudi Arabia," *Journal of International Oral Health*, vol. 10, no. 4, p. 192, 2018, doi: 10.4103/jioh.jioh_152_18.

[25] E. Ioannidou, "The sex and gender intersection in chronic periodontitis," *Frontiers in Public Health*, vol. 5, Aug. 2017, doi: 10.3389/fpubh.2017.00189.

[26] T. Borojevic, "Smoking and periodontal disease," *Materia Socio Medica*, vol. 24, no. 4, p. 274, 2012.

[27] S. M. Morgano *et al.*, "Burden of oral disease in the Middle East: opportunities for dental public health," *International Dental Journal*, vol. 60, no. 3s1, pp. 197–199, 2010.

[28] C. Wu *et al.*, "Epidemiologic relationship between periodontitis and type 2 diabetes mellitus," *BMC Oral Health*, vol. 20, no. 1, p. 204, Dec. 2020, doi: 10.1186/s12903-020-01180-w.

[29] F. Graziani, S. Gennai, A. Solini, and M. Petrini, "A systematic review and meta-analysis of epidemiologic observational evidence on the effect of periodontitis on diabetes An update of the EFP-AAP review," *Journal of Clinical Periodontology*, vol. 45, no. 2, pp. 167–187, Feb. 2018, doi: 10.1111/jcpe.12837.

[30] L. Casanova, F. J. Hughes, and P. M. Preshaw, "Diabetes and periodontal disease: a two-way relationship," *British Dental Journal*, vol. 217, no. 8, pp. 433–437, Oct. 2014, doi: 10.1038/sj.bdj.2014.907.

[31] R. Nagpal, Y. Yamashiro, and Y. Izumi, "The two-way association of periodontal infection with systemic disorders: an overview," *Mediators of Inflammation*, vol. 2015, pp. 1–9, 2015, doi: 10.1155/2015/793898.

[32] S. S. Reddy, K. Kripal, S. K. Nair, and P. A. Kumar, "Prevalence and incidence of periodontal diseases in diabetes mellitus patients," *EC Dental Sciences*, vol. 9.5, pp. 173–181, 2017.

[33] J. E. Botero *et al.*, "Tooth and periodontal clinical attachment loss are associated with hyperglycemia in patients with diabetes," *Journal of Periodontology*, vol. 83, no. 10, pp. 1245–1250, Oct. 2012, doi: 10.1902/jop.2012.110681.

[34] M. Al-Houqani *et al.*, "Patterns of tobacco use in the United Arab Emirates Healthy Future (UAEHFS) pilot study," *PLOS ONE*, vol. 13, no. 5, p. e0198119, May 2018, doi: 10.1371/journal.pone.0198119.

[35] B. Hira, H. Azam, H. N. Noor, Z. Bushra, K. Amna Nauman, and K. Nauman Rauf, "Clinical attachment loss and periodontal health status of smokers versus non-smokers: a comparative study," *Stud J Gandhara University*, vol. 1, no. 1, pp. 26–31, 2021.

BIOGRAPHIES OF AUTHORS

Danavanthi Bangera I am working as a Medical Director and Dental Surgeon in Thumbay Dental Hospital, Thumbay Medicity, Al Jurf, Ajman, UAE. I did Bachelor of Dental Surgery from Government Dental College & Hospital, Mumbai University, India and Masters in Public Health from Gulf Medical University, Ajman, UAE in the year 2015. Presently, pursuing part time PhD in Periodontics from Annamalai University, India, I have 20 years of clinical experience, and publications of 5 articles. She can be contacted at email: dhansbang@gmail.com.

Krishnan Viswanathan Professor of Periodontology, Rajah Muthiah Dental college and hospital, Annamalai University, Annamalai Nagar, Tamilnadu. I have a teaching experience -33 yrs, as a D ean -2 yrs, Head of the department i/ c -4 yrs, guided more than 20 PG's PhD guided for 1 scholar. Currently I am doing research 3 scholars, I am question paper setter for NEET entrance by NBE, New Delhi, PG examiner for other state university Published more than 25 research articles in International and National peer reviewed journals. Reviewer for JISP pubmed journal last 6 yrs and reviewed more than 20 articles Areas of interest. Biomarkers in Saliva and GCF, Membrane, local drug delivery using herbal remedies, animal studies. He can be contacted at email: Drkrish66@gmail.com.

Jayadevan Sreedharan Currently is working as Professor of Epidemiology and Biostatistics at Gulf Medical University, Ajman, United Arab Emirates, Program Director - Master of Public Health and Adjunct Professor at University of Arizona, United States of America. He has completed his PhD in Biostatistics from University of Kerala, India (2000) and PhD in Epidemiology from Tampere University, Finland (2014). He can be contacted at email: drjayadevan@gmu.ac.ae.

Prabhu Manickam Natarajan (PERIODONTICS), FDS RCPS Glasgow, FDT F Edinburgh, F FGDP UK. Faculty in Periodontics, College of Dentistry, Ajman University, United Arab Emirates. I hold Fellowship of The Faculty of Dental Surgery, Royal College of Physicians and Surgeons, Glasgow, UK, Faculty of Dental Trainers, Royal College of Surgeons of Edinburgh, UK and Faculty of General Dental Practice, Royal College of Surgeons of England, UK. I have seventeen years of teaching experience and have 5 books and 35 articles publication. He can be contacted at email: prabhuperio@gmail.com.