Received: 5 Nov 2012
Revised: 19 Dec 2012
Accepted: 21 Dec 2012

Determination of the Incidence of Dental Caries and Periodontal Disease among Shiraz, Iran, Residents

Noozhan Karimi^{1✉}, Vahid Esfahanian², Parvin Khadem³

¹ Postgraduate Student Of Periodontics, Student Research Committee, School of Dentistry, Shiraz University of Medical Sciences, Shiraz, Iran.

² Assistant Professor, Dept of periodontics, School of Dentistry, Khorasgan Branch of the Islamic Azad University, Khorasgan (Esfahan), Iran.

³ Assistant Professor, Dept of Community Dentistry, School of Dentistry, Khorasgan Branch of the Islamic Azad University, Khorasgan (Esfahan), Iran.

Abstract

Introduction: Dental caries and periodontal disease are among the most common infectious diseases in the world. DMFT (Decayed, Missing, Filled, Teeth), CPITN (Community Periodontal Index of Treatment Needs), and plaque indices are applied as suitable criteria for evaluating these two diseases and oral health. Given the significance of dental caries and periodontal disease, the objective of this study was to determine the incidence of dental caries and periodontal disease in the Iranian city of Shiraz. **Material and Methods:** The samples were evaluated in the four categories of medical, manufacturing, educational, and office centers within Shiraz, and then the DMFT, CPITN, and plaque indices in addition to nutrition status were all measured among them. **Results:** Having considered the DMFT to be below 15% and the CPITN less than 1.5 (the variables' mean in the population under study), respectively, as resistant to dental caries and periodontal disease while at the same time taking into account the plaque index of less than 1.25 (mean) as the low level of this very index not disregarding the nutritional status of the population under study: the resistant individuals ratio to the two diseases equaling 10%, those individuals prone to these two diseases equaling 55%, the ratio of resistant people to periodontal disease and, simultaneously, prone to dental caries equaling 14%; and, lastly, the ratio of individuals resistant against dental caries simultaneously prone to periodontal disease equaling 20% (estimated). **Conclusion:** The research was performed in medical, manufacturing, educational, and office centers in Shiraz, Iran. There was no significant difference in terms of periodontal disease and dental caries between the four groups. [GMJ. 2012;1(2):66-71]

Keywords: Periodontal Index; Dental Caries; DMFT Index; Periodontal Disease; Dental Plaque Index

Introduction

Periodontal disease is an infection affecting the dental containing tissues within the Alveol cavity and is one of the most common and oldest chronic diseases in humankind in the past and present.¹ Dental caries is a type of germ disease of teeth, leading to the dissolution and destruction of calcium tissues.^{2,3} According to the statistics published in Italy in 1991, the percentage of samples without periodontal disease was very low. Moreover, there was a significant decrease in the number of those without periodontal disease as the patients aged: 13.3% in the cohort of patients between 20 and 24 years of age reduced down to 2.2% in the cohort of patients between 55 and 64 years of age.⁴

Peterson et al.⁵ conducted a study in Madagascar on a sample of 900,000 people and observed that 91% of the age group of 18 years old and 72% of the age group of 34-44 years old were affected by gingival bleeding and had dental plaques.

Confirming the effect of the geographical region, Benjamin⁶ stated that the prevalence and severity of periodontal disease were slightly higher in rural areas than those in urban areas. According to the Loe et al. theory,⁷ the periodontal disease prevalence increases with age. In a research conducted by Naston⁵ on a group of students between 6 and 15 years old in a school in Maryland, almost 90% of the girls and 88.4% of the boys were suffering from periodontal disease and 65% of the girls and 50% of the boys had dental caries. It seems that by the age of 14 years, girls are more likely to be affected by periodontal disease than boys; this could be in consequence of the earlier growth of teeth in the former sex. In his research conducted in Kerman in the age group of 12-15 years old, Meimandi^{1,8} concluded that in the 15-year-old age group, 12.7% of the individuals were healthy as to periodontal disease, 30.9% had gingival bleeding, 28.2% had plaques, and 28.33% had low pocket depths and pockets deeper than 6 mm. Also the results of studies done on individuals aged between 5 and 19 years in different countries of the world have indicated that in all age groups, the DMFT mean in girls is

higher than that in boys.^{8,9}

Eshraghian and Kenzelle^{1,8} reported the results of their research on the DMFT in people aged between 5 and 70 years in the north-west of Tehran as follows: The mean of female teeth with caries was 2.8, while it was 3.49 in the males. Also, the number of filled teeth in teachers was more than that of other occupational groups. The authors concluded that a higher level of education was correlated with a lower frequency of dental caries and higher number of filled teeth.

In spite of the importance of statistical information on dental diseases, this subject has not been well established thus far as only limited investigations in limited regions have been undertaken. Understanding the importance of investigating the distribution of dental diseases in different regions of our country, we sought to determine the incidence of dental caries and periodontal disease in the Iranian city of Shiraz. The terms and the methods to reach this aim are described in detail in the following sections.

Material and Methods

The present study was a descriptive-analytic and cross-sectional study, conducted after obtaining the required permits from the heads of relevant research centers. All the examination procedures followed the principles of the Declaration of Helsinki. As it was an observational study, informed consent was obtained from the subjects after they had received comprehensive explanations about the nature of the research. All the personal information of the patients was kept private. This study was approved by the Ethics Committee of the Medical University of Khorasgan, Isfahan.

The research was carried out in a group containing 174 staff members of four medical, manufacturing, educational, and office centers in Shiraz, Iran. The participants were non-smokers, over 30 years of age, and had at least 20 teeth, without any systematic diseases affecting their oral condition. Hyperplastic gum disease was an exclusion criterion. The study population was selected via random sampling. In this study, a questionnaire containing items related to demographic variables and nu-

tritional status of the individuals as well as physical examination forms for recording the amount of the DMFT, CPITN, and Silness-LoePlaque Index was used.

The Silness-LoePlaque Index was measured as described below in the four levels of distal facial, mesial-facial, facial, and lingual of first molars, first premolar and central in each quadrant using mirror and probe, as is described in Table 1.

The plaque index was obtained by adding the figures of the four above-mentioned areas of each teeth and dividing it by 4 before recording it in the examination form.

To determine the dental status of the individuals, the DMFT index (according to the WHO's criteria) was used. In this index, D represents the number of teeth with decay that are in need of repair, M represents the number of missing teeth that have been extracted due to high caries, F represents the number of teeth with filling, and T represents the number of teeth. By adding the four components of D, M, F, and T, the DMFT amount is calculated.

The CPITN is utilized for an easier record and quicker control of examinations and provides the possibility for the evaluation of the periodontal status of patients.⁵ In order to record an index, an instrument called "Probe WHO" is employed. The thickness of the probe head is 0.5 mm, and it is spherical in shape. Not only can the plaque below the gum line be diagnosed by this instrument, but also the pocket depth is recorded accurately. The black part is 3.5-5.5 mm away from the probe head, which confers a convenient measurement of the pocket depth.⁸ The coding criteria of the CPITN Index are presented in Table 2.

Table 1. Silness-Loe Plaque Index

Silness-Loe Plaque Index	Criteria
0	Absence of microbial plaque
1	Thin film of microbial plaque along the free gingival margin
2	Moderate accumulation with plaque in the sulcus
3	Large amount of plaque in sulcus or pocket along the free gingiva margin

Table 2. CPITN Index

CPITN index	Criteria
0	Health
1	Bleeding
2	Plaque
3	The packet depth is 4 to 5 mm. (the black area of the probe can be seen)
4	The pocket depth is 6 mm. or more (the black area of probe cannot be seen)
X	The removed sextant, the highest code in each area, was considered as sextant code in examination form.

All the statistical and analytical calculations in this review were conducted by SPSS Inc. 16.0. In this research, the analytical statistical methods included mean and ratio calculations, the T test (to compare the two group), the ANOVA test (for more than two groups), and pretest LSD (Least Square Difference) if required, and the Pearson correlation coefficient was calculated for the analysis of the correlation between the quantitative variables.

Results

The comparison of the means ($\pm$ standard deviation) of the plaque index in the four different environment categories demonstrated that based on the ANOVA test, there was no significant statistical difference between the plaque index in the environments under investigation (P value =0.12) (Table 3). The mean was 1.25 in the total population under study.

The analysis of the nutritional status in the environments under study, in terms of being normal or abnormal, indicated that in comparison with the office staff, the ratio of the normal nutritional status of the people in the medical, manufacturing, and educational environments was significantly higher than that of those with an abnormal nutrition status, whereas in the office staff, the two ratios were closer. About three quarters of the participants had a normal nutritional status (Table 4).

The mean comparison of the DMFT index in

Table 3. Comparison of plaque index mean (standard deviation $\pm$) in the environments under investigation

PI Research Environment	Quantity	Mean	Standard Deviation	Minimum	Maximum
Medical	44	1.40	0.33	0.7	2.06
Administrative	49	1.54	0.36	0.79	2.06
Manufacturing	38	1.51	0.51	0.00	2.29
Educational	43	1.36	0.44	0.62	2.00

Table 4. Frequency distribution of nutritional status in environments under study

Nutrition Environment under study		Normal Nutritional Status	Abnormal Nutritional Status	Total
Medical	Number	37	7	44
	Percent	84.09	15.90	100
Industrial	Number	29	9	38
	Percent	76.31	23.68	100
Administrative	Number	27	22	49
	Percent	55.1	44.89	100
Academic	Number	39	4	43
	Percent	90.69	9.30	100
Total	Number	132	42	174
	Percent	75.86	24.13	100

Table 5. Mean comparison ($\pm$ Standard deviation) of DMFT index in environments under study.

DMFT Research Environment	Quantity	Mean	Standard Deviation	Minimum	Maximum
Medical	44	0.17	0.03	0.10	0.26
Administrative	49	0.18	0.03	0.11	0.26
Educational	38	0.16	0.06	0.03	0.30
Manufacturing	43	0.17	0.05	0.01	0.28

the four areas revealed that according to the ANOVA test, there was no significant statistical difference between the DMFT index in the environments under study (p value =0.1) (Table 5). The mean of this index was 1.5% in the study population.

In comparison of the CPITN mean index in the four areas based on the ANOVA test, there was a significant statistical difference between the CPITN index in the environments under study (P value =0.01). The mean of this index was 1.5 in the study population.

According to the Pearson Correlation Coefficient, there was a significant statistical difference in the total population under study as regards the CPITN, DMFT and Silness-

LoePlaque Index. The correlation between the plaque and the CPITN index was stronger than the other correlations (Table 6).

The mean comparison of the DMFT index showed a significant difference between the subjects with a normal nutritional status and those with an abnormal nutritional status in the total study population (p value =0.04, 0.19 ± 0.047 , and 0.16 ± 0.049 , respectively).

According to the data of the present study, the ratio of the individuals resistant to caries was 16.66%, individuals resistant to periodontal disease 10.34%, individuals at risk for caries 10.91%, and individuals at risk for periodontal disease 14.36%. Also, the rate of the participants infected by periodontal disease

Table 6. Mean comparison ($\pm$ Standard deviation) of CPITN index in environments under study.

CPITN Research Environment	Quantity	Mean	Standard Deviation	Minimum	Maximum
Medical	44	1.58	0.31	0.83	2.33
Administrative	49	1.85	0.46	0.83	2.54
Educational	38	1.73	0.51	0.00	2.66
Manufacturing	43	1.64	0.41	0.83	2.33

Table 7. Correlation analysis between CPITN, DMFT and plaque in total population under study

First Variable	Second Variable	Correlation Coefficient (r)	Pv
Plaque index	DMFT	0.56	0.00
Plaque index	CPITN	0.86	0.00
DMFT	CPITN	0.52	0.00

was 44.82%, individuals infected by caries 52.87%, those not infected by caries 19.54%, and the ones not infected by periodontal disease 30.45%.

The frequency distribution of the different dental-periodontal status in the population under study is depicted in Table 7.

Discussion

Incidence of dental caries has been increased throughout the world in recent years. It seems that this increase was influenced by various factors. The prevalence of periodontal disease and resultant high rates of tooth loss along with numerous systematic problems exacerbated by chronic periodontitis underscores the importance of attention to this disease.¹⁰

In evaluating the relationship between the DMFT and the CPITN in various environments under study, the correlation was direct ($0 < r < 1$) and significant. In other words, the less the caries and the higher the level of dental and oral health is, the better the individuals' periodontal health status would be (Table 6).

Separation of health status from disease regarding dental caries and periodontal disease, due to the lack of clear boundaries between these two phenomena and especially without having objective and well-defined criteria, would complicate matters¹¹ and even more so when taking into account the concept of potential resistance to disease due to several

factors and the impossibility of their measurement or control.¹²

In the present study, the frequency and distribution of the resistant, infected, and non-infected individuals with respect to dental caries and periodontal disease was assessed in the inhabitants of Shiraz by calculating the DMFT, the CPITN Index, and the Silness-LoePlaque Index as the standard tools for measuring dental caries and periodontal disease and by considering the amount of dental plaque as the main cause of periodontal disease and also the amount of plaque and nutritional status as the factors involved in caries. By measuring the mean of each Silness-LoePlaque Index (1.25), DMFT (15%), and CPITN (1.5), individuals with equal amounts or higher means were considered as a high degree of index and those with lower means were regarded as a low degree of index. Consequently, the potential, resistance, infection, or non-infection to dental caries and periodontal disease were defined as follows:

- ∑ Resistant to periodontal disease: high level of plaque and low CPTIN
- ∑ Susceptible (at risk for) to periodontal disease: low plaque and high CPTIN
- ∑ Infected to periodontal disease: high level of plaque and high CPTIN
- ∑ Non-infected to periodontal disease: low plaque and low CIPTIN
- Resistant to caries, one of the following conditions:
 - A) High level of plaque, abnormal nutrition

- and low DMFT
- B) High level of plaque, normal nutrition and low DMFT
 - C) Low level of plaque, abnormal nutrition and low DMFT
 - Susceptible to caries: low level of plaque, normal nutrition and high DMFT
 - Infected to caries: one of the following conditions:
 - A) High level of plaque, normal nutrition and high DMFT
 - B) Low level of plaque, abnormal nutrition and high DMFT
 - C) High level of plaque, abnormal nutrition and high DMFT
 - Non-infected to caries: low level of plaque, normal nutrition and low DMFT

Conclusion

Based on the CPITN Index and the DMFT among the four groups, there was no significant difference between periodontal disease and dental caries.

The findings of the present study showed that more than half of the population investigated was concurrently prone both to dental caries and periodontal disease: this would be justifiable in view of the in-common mechanisms specifically over the issue of dental plaques. On the other hand, there was no ratio of individuals simultaneously resistant to both diseases. Fortification of plaque control methods, in addition to hygiene education could be an effective way in adjusting these ratios in favor of those resistant to both dental caries and periodontal disease.

Acknowledgment

With profound thanks to the esteemed authorities of Dentistry University of Khorasgan and all those who assisted us in performing this research.

References

1. Künzel, W. The impact of changing patterns in dental diseases on the practice of orthodontics. *Int Dent J*.1987; 37(2):77-85.
2. Newman, MG., Takei, H., Caranza, FA., Klokkevold, PR. *Clinical periodontology*. 10th ed. Philadelphia: W.B. Saunders Co.2006; 166-79.
3. Vonder, F. Caries prevalence in the Nordic countries. *Int Dent J*.1995;36(2):37-51.
4. Strohmer, MC., Cerati, M., Robilla, EB. Periodontal epidemiology in Italy by CPITN. *Int Dent J*.1991;41:313-5.
5. Mooze, MB., Moghaddas, H. *Attachment apparatus periodontium in health and disease*. 2nd ed. Jahad Publication, Tehran.1993;21-78.
6. Baer, PN., Benjamin, SD. Periodontal disease in children and adolescents by JB Lippincott.1974;37-38.
7. Loe, H., Anderud, A., Boysen, H. The natural history of periodontal disease in man study design and baseline data. *J Perio Res*.1978;13-50.
8. Eshraghian, MR., Kenzeli, B. Distribution of caries extraction of examination people in West North of Tehran. 1st ed. University of Tehran Publication.1998;10-11.
9. Chandra, S., Chandra, SH. *Textbook of preventive dentistry*. Delhi: Jaypee.1999; 145-85.
10. Ajami, BA., Shabzendeda, M., Rezay, YA., Asgary, M. Dental treatment needs of children with disabilities. *J Dent Res Dent Clinics*.Dental Prospects.2007; 1(2) 93-8.
11. Michael. *Clinical Periodontology*. 9th ed., Philadelphia: W.B. Saunders.2002; 186-201.
12. Grossi, SG., Zambon, JJ. Assessment of risk for periodontal disease. *J Periodontal*.1994;260-310.