Evaluation of the relationship of CPITN and DMFT index of adult patients in Turkey with their demographic characteristics: an epidemiological study

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ABSTRACT
This study aimed at determining the oral and dental health and periodontal condition of adult patients in southeastern Turkey. Nine thousand and five hundred patients aged of 18–79 were included in the study. Demographic characteristics and education level of individuals were recorded. The Community Periodontal Index of Treatment Needs (CPITN) was used for periodontal status. According to the World Health Organization criteria, the Decayed, Missing and Filled Tooth (DMFT) index was used. The collected data were analyzed statistically. The average DMFT values of individuals were 6.72 ± 4.21. There was a statistically significant difference between DMFT value and CPITN scores, depending on gender, age and education level (p < 0.001). According to the CPITN and DMFT indices, males had a 1.39-fold (95% CI: 1.33–1.45) and 1.01-fold (95% CI: 1.00–1.02) greater risk of gingival and dental health problems than females, respectively. Periodontal disease prevalence and DMFT values were determined to be high for those at older ages (57–69 age group) and low levels of education. It was also found that the oral health of males was worse than that of females.

Introduction
Nowadays, one of the most important causes of tooth loss is infections based on periodontal diseases and tooth decay [1]. Periodontal diseases are divided into two main groups: gingivitis and periodontitis. Although the main cause of periodontal disease is bacterial plaque, many factors such as hormonal changes, systemic diseases, oral hygiene habits, smoking and stress cause periodontal disease and its progression [2,3]. Periodontal diseases and tooth decay are common public health problems in many countries around the world [4]. Although microbial dental plaque is considered as the primary factor in the aetiology of periodontal disease and tooth decay, the habits of individuals and their socioeconomic and demographic conditions affect their oral health levels [3,5].

Periodontal diseases are the most common diseases worldwide. Although such diseases are present in all age groups, they are more common in the adult population regardless of gender, genetics, education, region and socioeconomic conditions [6]. Periodontal diseases can be treated easily and successfully when diagnosed early [7]. The severity and treatment requirement of the diseases are associated with each other. For this reason, epidemiologic screening of periodontal diseases is done by utilizing the fast, simple, easy and inexpensive Community Periodontal Index of Treatment Needs (CPITN) index [8,9]. Survey studies with clinical measurements are considered one of the most reliable methods for determining the current oral and dental health status in communities and for conducting future plans [10].

Recently, there has been a decrease in the prevalence of tooth decay in developed countries but an increase in developing countries. This increase in tooth decay varies according to countries and regions within countries [11,12]. The World Health Organization (WHO) recommends the use of Decayed, Missing and Filled Tooth count (DMFT) or surface count (DMFs) information in the evaluation of tooth decay prevalence [13]. The arithmetic mean values of decay prevalence can be obtained through DMFT or DMFs indices. A detailed analysis of the relevant literature revealed that no study has been performed with the CPITN and DMFT indices covering all regions of Turkey. Existing CPITN and DMFT studies are provincial and based on small sample sizes. In Turkey’s southern provinces and regions, no studies have been conducted based on the
CPITN and DMFT indices. For this reason, the aim of this study was to determine the relationship of the CPITN and the DMFT index with demographic characteristics of adult patients in southeastern Turkey.

**Subjects and methods**

**Ethics statement**

The study was approved by the Ethics Committee of Adıyaman University, Faculty of Medicine and written informed consent forms were collected from all patients. The study was conducted according to the principles outlined in the Declaration of Helsinki on experimentation involving human subjects.

**Subjects**

This was a cross-sectional epidemiological research study. The study group included 4932 women and 4568 men for a total of 9500 patients aged 18–79 who were randomly selected from December 2018 to June 2019. Prior to enrolment, the objectives of the research were explained. Patients were informed what the participation in the research was. This study was conducted at the Faculty of Dentistry in the provinces of Diyarbakır, Şanlıurfa, and Gaziantep, mostly at the Periodontology Clinic of the Faculty of Dentistry of Adiyaman University, all of which are in the southeast region of Turkey. Clinical measurements were performed to determine the periodontal condition and tooth decay of individuals. For the statistical analysis, individuals participating in the study were divided into age groups: 18–30, 31–43, 44–56, 57–69 and 70–82 years.

**Clinical oral examination**

In the study, clinical examinations of patients were performed by three dentists. To standardize the examinations and clinical measurements, the dentists created and distributed examination and clinical measurement instructions among themselves. Then, each dentist examined at least 10 people from each age group within a week and conducted clinical measurements. The examination results of the dentists were subsequently compared, and the sensitivity and specificity values showed agreement between the dentists at the level of 85% [13]. The exclusion criteria for patients were uncontrolled systemic disease, the presence of fewer than two teeth in each sextant, antibiotic treatment (in the 1 month) prior to the study, periodontal treatment in the last 6 months and age under 18 years. Systemically healthy patients aged 18–77 years were included. No patients had had orthodontic treatment or had used fixed prosthetic bridge prostheses.

**DMFT index**

For this study, digital bitewing radiographs (Belmont Phot-X II Model 303-H, Takara, Belmont Corp. Japan), which were taken in the last 3 months from the patients during routine examination, were used. The condition of all the patients’ teeth was determined by clinical and radiographic evaluation. The overall caries experience of each individual was determined according to the DMFT index based on clinical and radiographic findings. During the clinical evaluation, the patients were clinically examined by a researcher, by drying the teeth in a lighted environment with the help of a mouth mirror and a WHO probe (Hu Friedy, Chicago, IL), according to WHO’s diagnostic recommendations [12]. The initial lesions at the enamel level were not considered caries when the radiographic examination was performed.

**Periodontal examination**

In our research, whole oral examinations of the individuals were made from four surfaces of each tooth and CPITN [8] data were recorded. All patients were examined clinically to evaluate the periodontal and dental status of all teeth except third molar teeth. The ten permanent index teeth (17, 16, 11, 26, 27, 47, 46, 31, 36 and 37) were evaluated for each patient. The worst condition of the teeth was taken into consideration in the scoring of each sextant. The highest scores were recorded. In the CPITN, 0: healthy periodontium, 1: presence of gum haemorrhage, 2: calculus presence along with gingival haemorrhage, 3: shallow periodontal pocket presence (4–5 mm) and 4: deep periodontal pocket presence (6 mm and above) [10]. In our study, patients with CPITN 1 and 2 scores were identified as having ‘gingivitis’, and patients with CPITN 3 and 4 scores were identified as having ‘periodontitis’ [14]. All periodontal measurements were performed by three periodontists (X. X. X) using a WHO probe.

**Statistical analysis**

The data were evaluated with SPSS 15.0 package software (SPSS, Chicago, IL). The descriptive statistics were presented as average values, standard deviations (SDs), and percentage distributions. In parametric analyses for normally distributed data, the chi-square test
(χ²) was used to investigate the relationship between categorical variables. Logistic regression analysis was used in the multivariate evaluation of the relative impact of demographic characteristics affecting the DMFT and CPITN indices. The statistical significance level was set at \( p < 0.05 \).

**Results and discussion**

The distribution of the patients according to gender, age and education status in the study groups is shown in Table 1. The study included 4568 (48.1%) males and 4932 (51.9%) females for a total of 9500 patients aged 18–79 (31.63 ± 10.21). The education levels of the majority of participants were determined to be secondary school and university (30.9 and 27.9%, respectively).

The highest CPITN values of the patients are shown in Table 2. Bleeding was observed in 36.29% of the patients after the pocket probe, which was made gently with a periodontal probe (CPITN score 1). However, 36.24% of patients had calculus in their teeth (CPITN score 2). Only 10% of patients had healthy periodontal gingiva (CPITN score 0). In addition, 15.15% of patients had a shallow (4–5 mm) gingival pocket in at least one sextant and 2.32% of them had a deep periodontal gingival pocket (6 mm ≤) (CPITN scores 3 and 4). According to the CPITN, 10% of the patients showed satisfactory periodontal health, 72.53% had gingivitis and 17.47% had periodontitis.

There was a statistically significant relationship between gender and CPITN scores (\( p < 0.001 \)). More females had CPITN scores of 0, 1 and 2 than males; and males had more CPITN 3 and 4 scores than females. There was a significant relationship between age and CPITN scores (\( p < 0.001 \)). In general, the increase of age was associated with an increase in CPITN scores. In addition, the rate of periodontal health decreased with age (CPITN score 0). There was a significant relationship between the education level of the patients and the CPITN scores (\( p < 0.001 \)). The increase in the level of education was associated with an increase in CPITN 0 scores and a decrease in CPITN 4 scores.

The CPITN values of the sextants affected by the severity of periodontal disease are shown in Table 3. There was a statistically significant relationship between the CPITN values in the sextant and gender, and age (\( p < 0.001 \)). In general, CPITN 2 and 3 scores were common in males and CPITN 0, 1 and 4 scores were common in females in the sextants. In females, CPITN 0 scores were common in the first sextant, but CPITN 1, 2, 3 and 4 scores were common in males. There was an increase in CPITN scores in the sextants with age. In sextant 6, CPITN 0, CPITN 2, CPITN 1 and

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**Table 1. Demographic characteristics of subjects.**

| Variable         | Categories (n) | Percent (%) | Mean ± SD | \( p \) value |
|------------------|----------------|-------------|-----------|--------------|
| Total sample     | 9500           | 100.0       |           |              |
| Gender           |                |             |           | <0.001       |
| Female           | 4932           | 51.9        |           |              |
| Male             | 4568           | 48.1        |           |              |
| Age (years)      |                |             | 31.63 ± 10.21 | <0.001       |
| 18–30            | 4045           | 42.6        |           |              |
| 31–43            | 3334           | 35.1        |           |              |
| 44–56            | 1722           | 18.1        |           |              |
| 57–69            | 378            | 4.0         |           |              |
| 70–82            | 21             | 0.2         |           |              |
| Education level  |                |             |           | <0.001       |
| None (pre-school)| 419            | 4.4         |           |              |
| Elementary school| 1967           | 20.7        |           |              |
| Middle school    | 1276           | 13.4        |           |              |
| Secondary school | 2937           | 30.9        |           |              |
| University       | 2646           | 27.9        |           |              |
| PhD or above     | 255            | 2.7         |           |              |

The data were analyzed using \( \chi^2 \) test, \( p < 0.05 \).

**Table 2. Prevalence of subjects by highest CPITN score.**

| Variable         | Healthy periodontum (CPITN 0) | Bleeding on probing (CPITN 1) | Calculus (CPITN 2) | Shallow pockets (CPITN 3) | Deep pockets (CPITN 4) | \( p \) value |
|------------------|-------------------------------|-------------------------------|--------------------|--------------------------|------------------------|--------------|
| Total sample     | 9500                          |                               |                    |                          |                        |              |
| Gender           |                               |                               |                    |                          |                        |              |
| Female           | 10 (950)                      | 36.29 (3448)                  | 36.24 (3443)       | 15.15 (1439)             | 2.32 (220)             | <0.001       |
| Male             | 9.90 (519)                    | 40.63 (2004)                  | 37.08 (1829)       | 10.24 (505)              | 1.12 (55)              |              |
| Age (years)      |                               |                               |                    |                          |                        |              |
| 18–30            | 16.34 (661)                   | 45.69 (1848)                  | 31.55 (1276)       | 6.06 (245)               | 0.001 (15)             | <0.001       |
| 31–43            | 7.35 (254)                    | 34.19 (1140)                  | 32.33 (1078)       | 23.61 (787)              | 2.25 (75)              |              |
| 44–56            | 2.03 (35)                     | 21.20 (365)                   | 57.40 (989)        | 12.31 (212)              | 7.03 (121)             |              |
| 57–69            | 0                             | 19.84 (75)                    | 26.19 (99)         | 51.59 (195)              | 2.38 (9)               |              |
| 70–82            | 0                             | 95.24 (20)                    | 4.76 (1)           | 0                        | 0.001 (25)             |              |
| Education level  |                               |                               |                    |                          |                        |              |
| None (pre-school)| 7.16 (30)                    | 36.41 (145)                   | 43.91 (184)        | 8.35 (35)                | 5.97 (25)              | <0.001       |
| Elementary school| 5.49 (108)                   | 33.50 (699)                   | 39.55 (778)        | 15.1 (297)               | 6.35 (125)             |              |
| Middle school    | 4.31 (55)                     | 30.64 (391)                   | 44.04 (562)        | 19.83 (253)              | 1.18 (15)              |              |
| Secondary school | 12.94 (380)                  | 37.79 (1100)                  | 28.87 (848)        | 19.03 (559)              | 1.36 (40)              |              |
| University       | 12.93 (342)                  | 39.98 (1058)                  | 35.94 (951)        | 10.77 (285)              | 0 (10)                 |              |
| PhD or above     | 13.73 (35)                   | 33.33 (85)                    | 47.06 (120)        | 3.92 (10)                | 1.96 (5)               |              |

The data were analyzed using \( \chi^2 \) tests, \( p < 0.05 \).
3 and CPITN 4 scores were determined to be common in the 18–30, 44–56, 57–69 and 70–82 age groups.

There was a statistically significant relationship between the CPITN values in the sextant and education level \((p < 0.001)\). CPITN scores in the sextants decreased with the increased levels of education. In all sextants, the illiterate individuals had more CPITN 4 scores. At the secondary school level, the CPITN 2 score was determined as the most common in all sextants except for the fifth sextant. In those who graduated from university, the CPITN 1 score was determined to be the most common in third, fourth, and sixth sextants. The highest rate of CPITN 0 was found in second, fourth and fifth sextants for the PhD degrees and above (Table 4).

The average DMFT values of the patients are shown in Table 5. A statistically significant difference was found in the DMFT values depending on the demographic data of the patients \((p < 0.0001)\). The average DMFT value of individuals was \(6.72 \pm 4.21\). The average DMFT value of males was higher than that of females. The average DMFT value increased with age. The average MT value increased in advanced age groups. The average DMFT was reduced as the level of education of individuals increased. The average FT value was particularly high in those with PhD and higher education levels.

Independent variables considered to influence the CPITN and DMFT values were included in the multiple regression analysis. The resulting logistic model was statistically created from these variables. According to this model, the independent variables affecting CPITN and DMFT values are shown in Table 6. Males are at greater risk of high CPITN and DMFT values than females.

### Table 3. Prevalence of sextants of demographic characteristics by CPITN score.

| Variable | Sextants | Healthy periodontium (0) (%) | Bleeding on probing (1) (%) | Calculus (2) (%) | Shallow pockets (3) (%) | Deep pockets (4) (%) | \( p \) value |
|----------|----------|-----------------------------|----------------------------|-----------------|------------------------|----------------------|-------------|
| Gender   | Female   | 1. Sextant 38.99 37.79 19.57 3.45 0.20 | 2. Sextant 62.55 28.75 7.30 1.00 0.41 | 3. Sextant 36.39 39.52 21.35 2.64 0.10 | 4. Sextant 35.08 45.26 16.63 2.63 0.41 | 5. Sextant 14.40 52.01 28.53 4.56 0.51 | 6. Sextant 38.42 44.95 15.31 1.00 0.41 | <0.001 |
|          | Male     | 1. Sextant 38.24 31.76 22.99 6.90 0.11 | 2. Sextant 38.20 41.09 16.86 3.31 1.00 | 3. Sextant 36.89 34.22 22.66 6.23 0.12 | 4. Sextant 14.01 43.02 39.25 3.40 0.33 | 5. Sextant 36.78 35.31 23.75 4.05 0.11 | 6. Sextant 38.42 44.95 15.31 1.00 0.41 | <0.001 |
| Age (years) | 18–30    | 1. Sextant 45.24 38.6 12.86 3.21 0.11 | 2. Sextant 58.47 36.96 3.09 1.38 0.12 | 3. Sextant 41.04 41.41 16.69 0.74 0.12 | 4. Sextant 45.61 40.42 10.88 2.97 0.12 | 5. Sextant 18.91 52.01 25.09 3.71 0.12 | 6. Sextant 45.12 41.03 13.10 0.59 0.15 | <0.001 |
|          | 31–43    | 1. Sextant 32.06 35.84 24.30 7.65 0.14 | 2. Sextant 48.11 31.20 18.45 1.5 0.75 | 3. Sextant 24.22 29.33 27.29 4.35 0.30 | 4. Sextant 26.96 39.49 26.13 5.92 0.45 | 5. Sextant 8.30 50.81 33.89 5.58 0.42 | 6. Sextant 26.82 44.54 24.30 4.65 0.60 | <0.001 |
|          | 44–56    | 1. Sextant 36.12 30.78 27.58 4.07 1.16 | 2. Sextant 44.54 34.26 15.10 4.94 1.17 | 3. Sextant 24.22 29.33 27.29 4.35 0.30 | 4. Sextant 26.54 39.49 26.13 5.92 0.45 | 5. Sextant 15.68 51.71 49.07 1.80 1.75 | 6. Sextant 22.47 35.13 39.78 1.74 0.87 | <0.001 |
|          | 57–69    | 1. Sextant 28.84 10.32 51.59 7.94 1.32 | 2. Sextant 22.22 42.06 34.39 1.32 0.12 | 3. Sextant 20.90 35.71 15.61 26.46 1.48 | 4. Sextant 21.16 23.54 5.02 44.97 3.97 | 5. Sextant 1.33 41.01 50.02 5.29 2.38 | 6. Sextant 27.51 54.23 11.64 6.62 0.02 | <0.001 |
|          | 70–82    | 1. Sextant 38.10 47.62 9.52 4.76 0.11 | 2. Sextant 33.33 38.10 19.05 14.29 0.12 | 3. Sextant 19.05 42.85 23.81 9.52 4.76 | 4. Sextant 4.76 47.62 28.57 14.28 4.76 | 5. Sextant 0 47.62 47.62 4.76 0.12 | 6. Sextant 0 42.86 33.33 14.29 9.52 | <0.001 |

The data were analyzed using \( \chi^2 \) tests, \( p < 0.05 \).
females ([OR: 1.39, 95% CI: 1.33–1.45], [OR: 1.01, 95% CI: 1.00–1.02], respectively). The risk of high CPITN and DMFT values increases with age ([OR: 5.66, 95% CI: 3.24–9.90], [OR: 1.07, 95% CI: 0.98–1.18], respectively). With the increase in education levels, the risk of high CPITN and DMFT values is reduced ([OR: 0.98, 95% CI: 0.85–1.13], [OR: 1.02, 95% CI: 0.99–1.07], respectively).

Despite technological developments around the world, oral and dental health problems continue to increase. The main problems of oral dental health are tooth decay and periodontal diseases. To cope with these problems, it is crucial to raise awareness about the formation of tooth decay and periodontal disease, as well as take preventive measures. In the treatment of periodontal diseases, early diagnosis and regular

### Table 4. CPITN scores per sextant according to education levels.

| Education level (variable) | Sextants | Healthy periodontium (0) (%) | Bleeding on probing (1) (%) | Calculus (2) (%) | Shallow pockets (3) (%) | Deep pockets (4) (%) | p value |
|----------------------------|----------|------------------------------|----------------------------|-----------------|------------------------|---------------------|---------|
| None (pre-school)          | 1. Sextant | 47.73                        | 28.41                      | 15.51           | 5.97                   | 2.39                | <0.001 |
|                            | 2. Sextant | 41.53                        | 40.57                      | 10.74           | 2.39                   | 4.77                | 4.77    |
|                            | 3. Sextant | 36.75                        | 32.22                      | 26.23           | 3.58                   | 1.19                |         |
|                            | 4. Sextant | 40.33                        | 35.80                      | 14.32           | 4.77                   | 4.77                |         |
|                            | 5. Sextant | 13.12                        | 32.21                      | 45.11           | 5.97                   | 3.58                |         |
|                            | 6. Sextant | 34.61                        | 37.95                      | 17.90           | 5.01                   | 4.53                |         |
| Elementary school           | 1. Sextant | 31.27                        | 40.97                      | 20.08           | 7.42                   | 0.51                |         |
|                            | 2. Sextant | 45.60                        | 28.42                      | 22.37           | 3.10                   | 0.51                | 0.51    |
|                            | 3. Sextant | 25.78                        | 39.15                      | 29.49           | 5.59                   | 0                  | 0       |
|                            | 4. Sextant | 30.05                        | 40.47                      | 27.71           | 1.53                   | 0.25                |         |
|                            | 5. Sextant | 10.17                        | 30.20                      | 39.81           | 18.05                  | 2.29                |         |
|                            | 6. Sextant | 28.78                        | 40.68                      | 27.25           | 2.75                   | 0.56                |         |
| Middle school               | 1. Sextant | 26.41                        | 37.23                      | 32.52           | 3.84                   | 0                  | 1.49    |
|                            | 2. Sextant | 42.01                        | 30.96                      | 24.29           | 2.27                   | 0.47                |         |
|                            | 3. Sextant | 20.45                        | 38.01                      | 31.35           | 9.52                   | 0.78                |         |
|                            | 4. Sextant | 14.58                        | 41.76                      | 30.25           | 11.76                  | 1.10                |         |
|                            | 5. Sextant | 13.32                        | 43.10                      | 32.99           | 9.80                   | 0.77                |         |
|                            | 6. Sextant | 26.33                        | 30.64                      | 32.05           | 9.48                   | 1.49                |         |
| Secondary school            | 1. Sextant | 45.22                        | 32.31                      | 16.68           | 5.69                   | 0.10                |         |
|                            | 2. Sextant | 45.39                        | 43.75                      | 8.34            | 2.01                   | 0.51                |         |
|                            | 3. Sextant | 44.60                        | 28.50                      | 22.34           | 4.12                   | 0.37                |         |
|                            | 4. Sextant | 40.89                        | 31.87                      | 19.03           | 7.76                   | 0.27                |         |
|                            | 5. Sextant | 18.39                        | 46.98                      | 29.01           | 5.24                   | 0.38                |         |
|                            | 6. Sextant | 46.95                        | 33.67                      | 17.51           | 1.74                   | 0.14                |         |
| University                  | 1. Sextant | 43.27                        | 31.97                      | 20.03           | 4.35                   | 0                  | 0       |
|                            | 2. Sextant | 58.24                        | 34.77                      | 5.48            | 1.51                   | 0                  | 0       |
|                            | 3. Sextant | 31.93                        | 41.80                      | 24.57           | 1.52                   | 0.19                |         |
|                            | 4. Sextant | 41.76                        | 49.17                      | 8.13            | 0.94                   | 0                  | 0       |
|                            | 5. Sextant | 16.82                        | 50.49                      | 28.34           | 4.35                   | 0                  |         |
|                            | 6. Sextant | 41.95                        | 41.61                      | 12.09           | 4.34                   | 0                  |         |
| PhD or above                | 1. Sextant | 37.26                        | 31.38                      | 29.41           | 0                      | 0                  | 0       |
|                            | 2. Sextant | 88.24                        | 11.76                      | 3.14            | 0.78                   | 0                  | 0       |
|                            | 3. Sextant | 39.61                        | 34.91                      | 23.53           | 1.96                   | 0                  | 0       |
|                            | 4. Sextant | 41.33                        | 27.46                      | 26.66           | 2.75                   | 0                  | 0       |
|                            | 5. Sextant | 23.53                        | 62.75                      | 11.76           | 1.56                   | 0.40                |         |
|                            | 6. Sextant | 45.09                        | 28.63                      | 21.96           | 3.14                   | 1.16                |         |

The data were analyzed using $\chi^2$ tests, $p < 0.05$.

### Table 5. Mean DMFT according to demographic characteristics.

| Variable                | DT ± SD | p value | MT ± SD | p value | FT ± SD | p value | DMFT | p value |
|-------------------------|---------|---------|---------|---------|---------|---------|------|---------|
| Total sample            | 9500    |         |         |         |         |         |      |         |
| Gender                  |         |         |         |         |         |         |      |         |
| Female                  |         |         |         |         |         |         |      |         |
| Male                    |         |         |         |         |         |         |      |         |
| Age (years)             |         |         |         |         |         |         |      |         |
| 18–30                   |         |         |         |         |         |         |      |         |
| 31–43                   |         |         |         |         |         |         |      |         |
| 44–56                   |         |         |         |         |         |         |      |         |
| 57–69                   |         |         |         |         |         |         |      |         |
| 70–82                   |         |         |         |         |         |         |      |         |
| Education level         |         |         |         |         |         |         |      |         |
| None (pre-school)       |         |         |         |         |         |         |      |         |
| Elementary school       |         |         |         |         |         |         |      |         |
| Secondary school        |         |         |         |         |         |         |      |         |
| University              |         |         |         |         |         |         |      |         |
| PhD or above            |         |         |         |         |         |         |      |         |

The data were analyzed using $\chi^2$ tests, $p < 0.05$. SD: standard deviation.
dentist control are very important, as they require more complex and long-term treatment than other diseases. An analysis of the results of epidemiological studies to determine oral and dental health in Turkey revealed that dental and gingival health were not prioritized and that tooth decay and tooth loss rates based on periodontal diseases were very high [15].

The CPITN is frequently used in periodontal field research. Although gingivitis, chronic periodontitis and calculus are not accurately predicted by this index, it is still widely used [6]. Epidemiological studies indicate that there is a direct correlation between inflammatory periodontal diseases and gingivitis regardless of dental plaque and its progression [16]. The CPITN has been used in adults in many industrialised European countries [17]. In our study, we used this index to determine the periodontal status of individuals. In our clinical study, there was a difference between periodontitis and gingivitis rates obtained from clinical examinations and rates from the CPITN. According to the clinical measurements, this difference was determined to be due to the fact that periodontitis was low and gingivitis was high in the CPITN. In this periodontal epidemiological study, we decided that the CPITN would be appropriate because it is easy, fast and inexpensive.

Although the gender-based predisposition to periodontal diseases has not been fully proved, it has been reported that periodontal health is worse in males than in females [18,19]. Vano et al. [20], Gökalp et al. [21], Kundu et al. [22] and Karaslan et al. [23] stated that females’ periodontal health and bleeding on probing (CPITN 0 and 1) scores were more common than those of males according to the CPITN. The results of our study are in agreement with the results of these studies. The higher rate of periodontal health among females can be explained by the fact that females pay more attention to oral hygiene care. Because it is easier to clean the teeth in the second sextant, it was found that the rate of periodontal health (CPITN 0 score) was lower in males than females. In the study performed by Kulak-Özkan et al. [17], the highest CPITN scores were found in the fourth sextant, but we found the highest values in the fifth sextant. Calculus accumulation is more common in the lower jaw because it is the region where the ducts of the lingual salivary glands are opened to the mouth.

The prevalence of periodontal diseases increases with advancing age. In elderly individuals, attachment loss, dental plaque and calculus formation are increasing [24,25]. El-Qaderi and Quteish Ta’ani [6] reported that the CPITN 0 score was most often determined in the 20–29 age group and the CPITN 3 and 4 scores were most often determined in the 50–60 age group. Pekiner et al. [26] reported that the CPITN 0 score was most often determined in the 17–34 age group and the CPITN 3 and 4 scores were most often determined in the 35–44 and 45–64 age groups. Bansal et al. [27] stated that the CPITN 3 and 4 scores were most often found in the 35–44 and 45–64 age groups, whereas the CPITN 3 and 4 scores were less often determined in the 65–74 age group. In our study, the 44–56 and 57–69 age groups were most often determined to have scores of 3 and 4, whereas the 70–82 age group was determined to have them the least often. The CPITN score 0 was most often determined in the 18–30 age group. These results are consistent with the literature findings. The lower frequency of CPITN 3 and 4 scores at the age of 70 and above may have occurred due to tooth loss after tooth extraction because of tooth decay and periodontal reasons.

In all age groups, the highest proportion of calculus and unhealthy gingiva was found in the fifth sextant. Healthy gingiva rates were the highest in the second sextant for the 18–30, 31–43 and 44–56 age groups.
and in the first sextant for the 57–69 and 70–82 age groups. We could not find any similar CPITN study of age groups by sextant, suggesting that our study is the first to explore this index depending on age and sextant. According to this, healthy gingival sextants change with advancing age. In addition, a relationship of shallow and deep pockets with sextants and age was not observed.

It was reported that the oral health of individuals improves as education level increases and periodic dentist control becomes widespread [28]. Vano et al. [20] and Karaaslan et al. [23] reported that CPITN scores were the highest in primary school graduates and the lowest in university graduates. Kundu et al. [22] revealed that as the level of education increased, there was an increase in CPITN 0 scores and a decrease in CPITN 3 and 4 scores. In the same study, there was no relationship of education level and CPITN scores of 1 and 2. Our findings are in line with Kundu et al. [22]. The highest level of dental calculus and unhealthy gingiva was found in the fifth sextant at all education levels. According to education level, healthy gingiva was seen in the second sextant at a high rate. We could find no study investigating CPITN values and education levels by sextant similar to the present study.

In our study, the mean the DMF value was 6.72, and the value was lower than the other reported findings in Turkey [29]. Kulak-Özkan et al. [17] reported the mean value of DMFT as 12.97. In our country, the average DMFT value ranges from 11 to 26 [30]. In a study conducted in Italy, the mean DMFT value was 3.49 [20]. In Greece, it ranges from 14 to 20 [31]. In a study conducted in India, the mean DMFT value was 4.41 [32]. Thus, average DMFT values vary according to age, gender, education level and society.

DMFT studies give important information in terms of how long the countries’ preventive dentistry practices have reached the base of society. In our study, the mean DMFT and MT values of men were higher than those of women. The findings of our study are consistent with the findings of Kulak-Özkan et al. [17] and Karaaslan et al. [23], but deviate from the findings of Gökcalp et al. [21] and Karaoğlanoglu et al. [33]. According to a study conducted in Italy, the DMFT value was higher in men than in women [20]. This can be explained by the fact that individuals have different oral hygiene habits and that males tend to have more missing teeth.

In a study in our country where the DMFT values were investigated based on age groups, the DMFT value in the 35–44 age group was 10.8, and the DMFT value in the 65–74 age group was 25.8 [21]. In Greece, the DMFT value of 20-year-olds was found to be 14, and in the age group of 65 and above, it was 20 [31]. In Germany, the DMFT value of the 35–44 age group was 9, and in the age group of 65 and above, it was 12 [34]. In Norway, the DMFT value of the 15–18 age group was 4.35 [35]. Behram et al. [36] reported that the DMFT values of the 20–29, 30–39, 40–49 and 50+ age groups were 7.4, 11.4, 11.3 and 11.4, respectively. In our study, the average DMFT values in the 18–30, 31–43, 44–56, 57–69 and 70–82 age groups were determined as 5.18, 6.60, 9.64, 10.92 and 9.14, respectively. The findings of our study are not consistent with the other study findings in our country. This may be due to some differences in the age range, sample volume and region that each research team has studied. In our study, the DMFT values increased with age, although the DT and FT values decreased. The highest value was noticeable in the 57–69 age groups. The high DMFT values are due to the increase of age-related MT. This suggests that patients are not sufficiently benefiting from treatment and preventive health services and prefer extracting rather than treating their teeth.

In our study, when we examined the relationship between education status and DMFT values, the lowest DMFT value was seen in people with PhD degrees and higher, whereas the highest DMFT values were seen in illiterate ones. Behram et al. [36] reported that the DMFT value was inversely proportional to the level of education. According to another study in Turkey, increased levels of education were associated with increased DMFT values [15]. In our study, as the level of education increased, the FT value increased, although the DT and MT values decreased. These DMFT findings are in line with Behram et al. [36]. Şahin et al. [15] reported that the DMFT values were proportional to the level of education, which can be explained by the high socioeconomic level of the society, and the DMFT values were found to be high due to the increase in FT values as the level of education increased. In studies conducted in Lithuania and Italy, as the level of education increased, the DT and MT values were determined to be lower and the FT values were determined to be higher [20,37,38]. In our study, there was no relationship between the DT value and the level of education. This may have occurred because of the difference in the number of individuals at the same level of education in society. In addition, the increased FT values in our study can be interpreted as indicating an increase in the tendency to go
to the dentist and receive treatment as the level of education of patients increased.

In our research, according to the CPITN and DMFT indices, males were at a 1.39-fold (95% CI: 1.33–1.45) and 1.01-fold (95% CI: 1.00–1.02) greater risk for gingival and dental health problems, respectively. Albandar et al. [39] stated that the cause of the difference between the sexes is not definitive, but it may be due to a lack of oral hygiene that is often observed in males.

Studies have indicated that there is an increase in CPITN and DMFT values with advancing age [20,30]. This condition can be associated with the increased severity of periodontal disease with age due to the chronic character of periodontal tissues and the duration of exposure to dental plaque. In addition, increases in missing teeth and unhealthy gingiva are observed in individuals with low education levels and advancing age [40]. In our study, according to the CPITN, the 18–30 and 57–69 age groups have a greater risk of periodontal disease than the 70–82 age group; 1.52-fold (95% CI: 0.88–2.63) and 5.66-fold higher (95% CI: 3.24–9.90), respectively. In addition, according to the DMFT index, the 18–30 and 57–69 age groups have a greater risk of oral health problems than the 70–82 age group, 0.76-fold (95% CI: 0.69–0.83) and 1.07-fold higher (95% CI: 0.98–1.18), respectively. In our study, the CPITN and DMFT values in the 70–82 age group were lower than those in the other age groups due to the low number of permanent teeth remaining in the mouths of the individuals in this age group.

Individuals with low levels of education visit the dentist less frequently and have less information about oral care (tooth brushing frequency, use of auxiliary cleaning tools, etc.) compared to individuals with higher education levels. These findings demonstrate that poor oral health behaviour increases the prevalence of periodontal disease [41]. Conversely, good oral health behaviour can reduce the prevalence of periodontal diseases. According to the CPITN and DMFT indices, illiterate people have a greater risk of oral health problems than those with a PhD and above; 1.33-fold (% 95 CI: 1.13–1.58) and 1.36-fold higher (% 95 CI: 1.31–1.42), respectively.

Our study was an original study of the periodontal conditions, education level, tooth decay and oral hygiene behaviours of adult individuals in Turkey. On the contrary, many current research studies focus on school-age children and young people [15,29,42].

Conclusions

It was observed that the prevalence of periodontal disease and DMFT values were high in those with low education levels and advanced age in southeastern Turkey. It was also found that the oral health of men was worse than that of women. This means that comprehensive oral hygiene training and preventive measures required for dental health should be initiated. The most effective way to prevent periodontal disease and tooth decay is to control it in childhood and young adulthood. It is especially important to benefit from the school environment where it is possible to reach a large number of school-aged children to teach well-planned preventive applications. In society, efforts should be made to improve oral care habits, especially for those with low education and elderly people, and training programmes should be developed. Tooth decay and periodontal disease risk should be reduced by facilitating access to groups at risk. To identify the groups at risk in society and to raise awareness about oral health, preventive field studies are needed.

Disclosure statement

There are no conflicts of interest to declare.

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