Association between Stress and Temporomandibular Disorder

Harukazu Kanehira, DDS, PhD, Akinori Agariguchi, DDS, PhD, Hisashi Kato, DDS, PhD, Shigeki Yoshimine, DDS, and Hiroshi Inoue, DDS, PhD

Department of Removable Prosthodontics and Occlusion, Osaka Dental University, Osaka, Japan

**Clinical significance**

Temporomandibular disorder, a functional disorder of the temporomandibular joint, is an important area of investigation in prosthodontics because it connects directly with masticatory dysfunction. This study shows that psychological factors such as stress have an influence on temporomandibular disorder.

**Abstract**

**Purpose:** To evaluate the causes of temporomandibular disorder (TMD) by examining the relationships between 3 major TMD symptoms, parafunction, and stress, a questionnaire survey was performed during dental examinations in corporations.

**Methods:** The survey was performed using 6 questions on the following topics: 1. Trismus; 2. Joint noise; 3. Pain; 4. Clenching in the daytime; 5. Nocturnal bruxism; and 6. Stress.

There were 3,225 subjects, 2,809 males and 416 females and the mean age of the subjects was 40.12 years. The relationships between questions 1 to 5 and question 6 were examined by the chi-square test.

**Results:** There were significant correlations (question 1, \( p = 0.001 \); questions 2–5, \( p < 0.001 \)).

**Conclusion:** Clearly, there was an influence of psychological factors, such as stress, on TMD, and such factors were considered to play important roles in its etiology, progression, and treatment. The results of this study suggest that well-controlled studies of TMD are necessary.

**Key words:** temporomandibular disorder (TMD), stress, etiology

**Introduction**

Occlusion, abnormalities in masticatory muscles, and organic changes, such as internal derangement, have been considered to induce temporomandibular disorder (TMD) causing dysfunction of jaw joints.\(^1\)\(^-\)\(^7\) Furthermore, involvement of parafunction, such as bruxism, has been reported.\(^7\)\(^-\)\(^13\) The mechanism of TMD has been examined based on the classification of pain.\(^14\) With changes in the etiology of TMD, involvement of occlusal factors alone in TMD has been re-examined,\(^15\)\(^-\)\(^19\) while psychological factors have been evaluated.\(^8\)\(^,\)\(^12\)\(^,\)\(^20\)\(^-\)\(^27\)

Laskin (1969) reported that the major cause of TMD is muscular hyperactivity induced by psychological stress and persistently poor oral habits, and that muscular fatigue causes spasm, resulting in temporomandibular displacement.\(^28\) Laskin further noted that this displacement causes occlusal abnormality, articular deformation, and muscular alteration, leading to organic disorder.\(^28\) The evaluation of TMD based on psychological factors has been considered important.\(^14\) However, there have been few reports of evaluation of TMD based on psychological factors in population-based studies.\(^14\)\(^,\)\(^26\)

In the present study, we performed a questionnaire survey to evaluate the causes of TMD by examining the relationships between 3 major TMD symptoms, parafunction and stress.

**Materials and Methods**

An interview survey was performed using a questionnaire, consisting of age, sex, and the following questions:

- Question 1: Do you sometimes have difficulties in opening your mouth?
- Question 2: Are you aware of noise during opening and closing your mouth?
- Question 3: Do you experience pain in or around the jaw joints during opening and closing your mouth?
- Question 4: Do you clench your teeth in the day-
Question 5: Do you clench or grind your teeth while asleep?

Question 6: Do you generally feel stress?

The subjects answered these questions with yes or no. With regard to questions 4 and 5, the answers were regarded as no when the subjects were unaware of clenching and bruxism. The subjects were asked to give answers about conditions at that time, independently of past signs and symptoms. All answers were subjective self-returns of subjects. The survey was performed between July 2005 and June 2006, and the total number of subjects was 3,225. There were 2,809 males and 416 females and the mean age of the group was 40.12 years (range 19–64). The relationships between questions 1 to 5 and question 6 were examined by the chi-square test. The level of significance was set at 5%. Analyses concerning sex and age groups were not performed in this study. This study protocol was approved by the Committee on Experimental Research on Humans of Osaka Dental University (No. 060715).

### Results

#### Data tabulation

Table 1 shows the results. Of the 3,225 subjects, 191 (5.9%) answered yes to question 1, 712 (22.1%) to question 2, 114 (3.5%) to question 3, 387 (12%) to question 4, 679 (21.1%) to question 5, and 1,473 (45.7%) to question 6.

#### Analysis by the chi-square test

Questions 1 and 6

One hundred and ninety-one subjects answered yes to question 1 (Do you sometimes have difficulty in opening your mouth?). Of the 191 subjects, 109/1,473 (7.4%) answered yes to question 6 (Do you generally feel stress?). This number was significantly larger than 4.7% (82/1,752) who answered no ($p = 0.001, \chi^2 = 10.6$; Fig. 1, Tables 1 and 2).

Questions 2 and 6

Of the 712 subjects who answered yes to question 2 (Are you aware of noise during opening and closing your mouth?), 25.9% (382/1,473) answered yes to question 6 with yes, and 18.8% (330/1,752) with no. The difference was significant ($p < 0.001, \chi^2 = 23.4$; Fig. 2, Tables 1 and 2).
Questions 3 and 6
With regard to question 3 (Do you experience pain in or around the jaw joints during opening and closing your mouth?), 114 subjects answered yes, and 3,111 no. Of the 114 subjects, 4.9% (72/1,473) answered question 6 with yes, and the remaining 2.4% (42/1752) with no. The difference was significant ($p < 0.001$, $\chi^2 = 14.6$; Fig. 3, Tables 1 and 2).

Questions 4 and 6
With regard to question 4 (Do you clench your teeth in the daytime or at work?), 387 subjects answered yes, and 2,838 no. Of the 387 subjects, 247/1,473 (16.8%) and 140/1752 (8.0%) answered question 6 with yes and no, respectively, with a significant difference ($p < 0.001$, $\chi^2 = 58.4$; Fig. 4, Tables 1 and 2).

Questions 5 and 6
Six hundred and seventy-nine subjects answered question 5 with yes, and 2,546 with no. Of the 679 subjects, 403/1,473 (27.4%) answered question 6 with yes, and 276 (15.8%) with no. The difference was significant ($p < 0.001$, $\chi^2 = 64.8$; Fig. 5, Tables 1 and 2).

Discussion
Data tabulation
There have been a number of studies related to questions 1 to 3, which correspond to 3 major TMD symptoms.12,16,17,26,29-37 However, since data reported by such studies ranged widely, it was difficult to compare them with the results of our study. In other words, since the investigation methods, number of subjects, and their age in this study differed from those of past studies, comparisons of data alone are insignificant.36 Comparisons of question 6 as a psychological factor,8,12,14,18,20-28,38-45 and questions 4 and 5 as parafunctional factors,8-13,21,25,38,40,44 which are considered to be related to TMD, are also insignificant. The present survey was performed on dental examinations in corporations, and the investigation time was limited. Therefore, the subjects were asked to answer simple questions. Such a survey will always be affected by investigation methods or populations.10,14,22,39 To minimize such effects, international standards, such as the TMJ scale, should be used.2,24,29,34 Furthermore, the investigation method has to be easily understood within a short time.11,12 The importance of population based studies rather than adult patients based studies has been reported.14,26,46 In the present study, the subjects were 3,225 general healthy adults, who worked at corporations, indicating that this survey was appropriate.

Analysis by the chi-square test
Analysis of the data by the chi-square test demon-
strated that questions 1 to 5 were significantly correlated with question 6 (question 1, \( p = 0.001 \), Fig. 1; question 2, \( p < 0.001 \), Fig. 2; question 3, \( p < 0.001 \), Fig. 3; question 4, \( p < 0.001 \), Fig. 4; question 5, \( p < 0.001 \), Fig. 5, Tables 1 and 2), indicating that stress affected the factors shown by questions 1 to 5.

Over the past 20 years, the involvement of occlusal factors in TMD as its etiology has been reexamined.\(^{14-19}\) This is because of the difficulty in study design unification and reproducibility. However, there have also been studies showing multiple and partial involvement of occlusal factors in TMD.\(^{7,9,12,14,15,35}\)

There seems little doubt that parafunctional factors are involved in TMD, but it has not been clarified whether these factors alone or their combination with other factors is involved.\(^{8,11,21,25,38,40,41}\)

In particular, it is necessary to perform a survey with strict methods for the detection of bruxism and clenching as parafunctional factors.\(^{13,39}\)

In the 1990s, studies showing that psychological factors, such as stress, are involved in TMD increased.\(^{14}\) It has been reported that increases in stress induce a somatic reaction, leading to a linear increase in TMD.\(^{31,39,41}\) It has also been reported that stress conditions vary depending on whether TMD is present, and hyperfunction develops into parafunction, i.e., bruxism and clenching.\(^{38,39}\) Studies performed using the TMJ scale, by which detailed evaluation of psychological factors, such as stress, is considered possible, indicated that TMD was significantly correlated with such factors.\(^{24,29}\)

Some studies suggested that these factors were involved in TMD based on the evaluation of hormones and somnipathy, but in many studies on the involvement of psychological factors, such as stress, the relationship between TMD and pain was examined.\(^{3,7,20,24,26,42}\) Since the pain level varies with sex, age, and occupation, it is always individually biased, suggesting that this parameter is pathologically inappropriate.\(^{26,27,42,44}\) Furthermore, since stress is strongly affected by an individual’s coping ability, its level could be changed by other factors, such as occlusal factors, indicating the necessity of consideration of their interactions and other risk factors.\(^{8,25,48,49}\)

In epidemiological studies, like ours, it is necessary to analyze populations in detail.\(^{10,12,13,22,36,39}\) However, with regard to TMD, evaluation of its expression in general populations is considered more important than evaluation of this disorder. Various complicated TMD signs and symptoms should be etiologically analyzed in a large population by community diagnosis and health.\(^{26}\) To perform such analyses, carefully designed, analytical, cross-sectional, and population-based studies are required.\(^{14}\)

There is a “chicken-and-egg” problem in trying to decide whether these psychological states have caused the functional problems, or are caused by them, or if any relationship exists at all. Psychological factors play an important role in the etiology, progression, and treatment of TMD.\(^{8}\) In the future, psychology-based therapies for TMD will be important and necessary.\(^{8,14,49}\)

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**Conclusion**

Stress was significantly correlated with the 3 major TMD symptoms and parafunction. In other words, psychological factors, such as stress, play important roles in TMD, suggesting that such factors and well-controlled studies should be taken into consideration in TMD treatment.

**References**

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