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Dentist practice patterns and therapeutic confidence in the treatment of pain related to temporomandibular disorders in a dental practice-based research network

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Aims—This study quantified the practice pattern of Japanese dentists in the management of pain related to temporomandibular disorders (TMDs), and identified associations between dentist characteristics and the decision to perform occlusal adjustment for TMD-related pain.

Methods—A cross-sectional study was conducted consisting of a questionnaire survey of dentists affiliated with the Dental Practice-based Research Network Japan (JDPBRN) (n=148). Participants were asked how they diagnosed and treated TMD-related pain. Associations between dentist characteristics and their decision to perform occlusal adjustment were analyzed via multiple logistic regression.

Results—113 clinicians responded the questionnaire for a 76% response rate. 81% of the participants (n=89) treated TMDs during the previous year. Dentists treated an average of 1.9 ± 1.8 (SD) patients with TMD-related pain monthly. Most JDPBRN dentists used similar diagnostic protocols, including questions and examinations. The most frequent treatments were splints or mouthguards (97%), medications (85%), and self-care (69%). Fifty eight percent of the participants performed occlusal adjustment for TMD-related pain. Multiple logistic regression analysis identified two factors significantly associated with the decision to perform occlusal adjustment. Odds ratios (95% CI) were “dentist lack of confidence in curing TMD-related acute pain”, 5.60 (1.260–24.861) and “proportion of patients with severe TMD-related pain”, 0.95 (0.909–0.999).

Conclusions—The most common treatments for TMD-related pain were reversible treatments. However, over half of dentists performed occlusal adjustment for TMD-related pain. There was a significant association between the decision to perform occlusal adjustment and lack of therapeutic confidence. The results of this study suggest that an evidence-practice gap exists regarding occlusal adjustment for TMD-related pain.

Keywords

Temporomandibular disorders; evidence-practice gap; practice-based research network; practice-pattern

INTRODUCTION

Temporomandibular disorders (TMDs) are one of the most common musculoskeletal pain conditions, and affect approximately 5% to 12% of the US¹ and 3% of Japanese populations.^{1, 2} Currently, initial treatment modalities for the management of TMD-related pain are considered to be self-care, pharmacological pain control, physical therapy and splint therapy.³ However, the initial management of TMD-related pain for general dentists has not been standardized. On the basis of the recent study conducted by the Dental Practice-based Research Network (DPBRN), now referred to as the National Dental PBRN (<http://NationalDentalPBRN.org>), significant differences in the clinical practice of TMD-related pain were noted between dentists, as well as between geographic regions in the network.¹ Although the clinical practice guideline⁴ recommends that occlusal adjustment should not be performed as initial treatment for TMDs because of its irreversibility and uncertainty of effectiveness, 64% of US dentists reporting using occlusal adjustment in their clinical practice.¹ However, the relationship between occlusal adjustment for TMD-related pain and specific dentist characteristics has not been clarified.

The recent establishment of the Dental Practice-based Research Network Japan (JDPBRN) created an opportunity for international comparisons. JDPBRN is a consortium of dental practices with a broad representation of practice types, treatment philosophies, and patient populations, and has a shared mission with the US National Dental PBRN⁵. Previous studies by the US National Dental PBRN^{6–10} and Dental PBRN Japan (JDPBRN),^{11–16} which included practitioners from the United States, Scandinavia, and Japan, revealed substantial variation between dentists regarding caries treatment,^{6,7,11,14} caries risk assessment,^{9,10,15} dietary counseling,¹² and caries prevention.^{8,13,16} However, practice patterns for TMD-related pain have not yet been examined in Japan.

The objectives of this study were to: (1) quantify the practice patterns of Japanese dentists in the management of pain related to TMDs; and (2) identify specific characteristics that are significantly associated with the decision to perform occlusal adjustment for TMD-related pain.

METHODS

Study design

This is a cross-sectional study consisting of a questionnaire survey. The study was approved by the Institutional Review Board of Kyushu Dental University (No. 13–73) and was conducted in accordance with the World Medical Association (WMA) Declaration of Helsinki. All participants provided informed consent prior to participation in this study.

Participants

The study queried dentists who worked in outpatient dental practices and who were affiliated with the JDPBRN (n=148). Participants were recruited from the JDPBRN website (<http://www.dentalpbrn.jp/>) and by targeted mailing. The network regions of the JDPBRN represent all seven major districts of Japan (Hokkaido, Tohoku, Kanto, Chubu, Kansai, Chugoku-Shikoku, and Kyushu). Every region has a Regional Coordinator, who distributed and gathered the questionnaires. Participants were asked to complete the questionnaire by hand and return it to the assigned Regional Coordinator in a pre-addressed envelope. Upon receipt, the Regional Coordinator reviewed the questionnaire for completeness.¹¹

Questionnaire

The same questionnaire were used as that developed in previous studies by the US National Dental PBRN¹. Four dentists and clinical epidemiologists translated these questionnaires into Japanese and added several questions about dentist and patient characteristics. The final version of this questionnaire is available at <http://www.dentalpbrn.jp/image/study2questionnaire.pdf>. Participants were asked about (1) how often they treated patients with TMD-related pain, (2) frequency of specific questions and examination items used to diagnose TMDs, (3) treatment modalities for TMD-related pain including occlusal adjustment, (4) type of splints, medications, and self-care instruction for treating pain related to TMDs and (5) dentist and patient specific characteristics.

Statistical analysis

A descriptive analysis was performed and means, standard deviations (SDs), and frequencies were reported. The numbers (percentage) of JDPBRN dentists who treated TMD-related pain for demographics, TMD-related pain diagnostic protocol and treatments were determined. The multiple-choice answers “Never,” “Sometimes,” “Half of the Time,” “Usually” and “Always” were categorized into “Never,” “Sometimes or Half of the Time” and “Usually or Always”. Multiple unconditional logistic regression analysis was then conducted to examine the relationship between independent variables and the performance of occlusal adjustment for TMD-related pain as a dependent variable. Independent variables were gender, years since graduation from dental school, dentist confidence in curing TMD-related acute pain, proportion of patients with severe TMD-related pain, number of TMD pain patients treated per month. Odds ratios (ORs) were calculated together with 95% confidence intervals (CIs). Statistical significance was set at $p < .05$. All statistical analyses were performed with the IBM SPSS Statistics® (version 19.0, IBM Corporation, Somers, NY).

RESULTS

Questionnaires were distributed to 148 dentists, and 113 (76.4%) responses were collected. All participants were Asian, of whom 83.6% ($n=92$) were male. 80.9 percent of the participants ($n=89$) had treated TMDs over the last 12 months. Mean years since graduation from dental school was 19.4 ± 11.0 (SD) years. The mean number of patients with TMD-related pain that dentists treated per month was 1.9 ± 1.8 (SD). Concerning the dentist therapeutic confidence in curing patients with TMD-related acute pain within 6 months of onset, “confident” for 31.5% ($n=28$), “neither agree nor disagree” for 43.8% ($n=39$), “not confident” for 24.7% ($n=22$). Regarding the most common symptoms that TMD patients usually or always reported, jaw pain accounted for 68.1% ($n=60$), problems with opening or closing the mouth for 59.8% ($n=52$), and temporomandibular joint (TMJ) noises for 51.7% ($n=45$). The mean proportion of patients with severe TMD-related pain was 10.7 ± 11.5 (SD). (Table 1)

TMD diagnostic protocol

The frequency of specific questions asked and examination protocols used are shown in Table 2. The most frequent questions dentists usually or always asked were “Do you have pain in your temples, face, jaw joint or jaws?” and “Do you have pain when you open your mouth wide?”, both at 98.9% ($n=88$). The most frequent examinations dentists usually or always performed were “Palpation of TMJ”, at 96.6% ($n=84$), and “Limitation of range of motion” and “Palpation of jaw muscles,” both at 92.0% ($n=80$).

Treatment for TMD-related pain

Table 3 shows the most frequently provided treatment for TMD-related pain. The most common treatments the participants recommended were splints or mouthguards (96.5%, $n=82$), over-the-counter (OTC) or prescription medications (84.7%, $n=72$), and self-care (69.4%, $n=59$). 57.6 percent of the participants ($n=49$) indicated that they would perform

occlusal adjustment for TMD-related pain. In contrast, the lowest proportion of dentists indicated referral to a physical therapist (4.7%, n=4).

Type of splints, medications, and self-care instruction for treating pain related to TMDs

Regarding the type of splint, the most commonly recommended was a hard custom mouth guard (usually or always: 40.0%, n=34), followed by a soft custom splint (19.3%, n=16). Regarding medication type, OTC medications sold directly to a consumer without a prescription from a healthcare professional were rarely recommended by the dentists (Table 4). Among the prescription medications, dentists most frequently recommended loxoprofen sodium (37.9%, n=33), followed by diclofenac sodium (8.5%, n=7) and Ibuprofen (7.2%, n=6). Regarding self-care, “avoid clenching or grinding teeth” was most commonly recommended by dentists (75.0%, n=66), followed by “relax your jaw (muscles) (64.8%, n=57)” and “identify pain triggers (59.8%, n=52)” (Table 4).

Factors affecting a dentist decision to perform occlusal adjustment for TMD-related pain

Multiple logistic regression analysis identified two factors significantly associated with the decision to perform occlusal adjustment (Table 5). Odds ratios (CI) for the decision were “dentist lack of confidence in curing TMD-related acute pain”, 5.60 (1.260–24.861) and “proportion of the patient with severe TMD-related pain”, 0.95 (0.909–0.999).

DISCUSSION

The results of this study indicate that most of the participants used similar diagnostic protocols to diagnose TMDs, including questionnaires and examinations. The most-used treatments were splints or mouthguards, medications, and self-care. Over half of the participants indicated that they would perform occlusal adjustment for TMD-related pain. There was a significant association between the decision to perform occlusal adjustment and lack of therapeutic confidence in curing TMD-related acute pain, and the proportion of patients with severe TMD-related pain.

Occlusal adjustment is irreversible and should only be used to “identify and eliminate gross occlusal discrepancies such as those that may inadvertently occur as a result of restorative procedures.”² However, 57.6% of JDPBRN dentists recommended occlusal adjustments to treat TMD-related pain, as did 64% of US DPBRN dentists¹. Although it is unclear whether this treatment was recommended primarily to eliminate gross occlusal discrepancies as a result of restorative procedures or as an initial treatment for TMD-related pain, this finding may suggest that occlusal adjustment is provided to patients more frequently than necessary. The Japanese Society for the temporomandibular joint evidence-based clinical practice guidelines state: “For TMD symptoms, we recommend against occlusal adjustment about primary treatment (Grade 1D)”.⁴ This in turn suggests the possible existence of an evidence-practice gap between the clinical guideline and actual practice regarding occlusal adjustment for TMD-related pain.

The results of multiple logistic regression analysis demonstrated that dentists with lack of therapeutic confidence in their ability to cure patients of TMD-related acute pain within 6 months of onset preferred the use of occlusal adjustment as an intervention. Thus, dentists

without confidence might be preoccupied by the idea that intervention is warranted, and finally decide to use occlusal adjustment. In addition, the results of multiple regression analysis also showed that dentists treating many patients with severe TMD-related pain tended to avoid using occlusal adjustment. This result may suggest that dentists treating many patients with severe TMD-related pain do not perform occlusal adjustment according to their clinical practice guidelines.

On the basis of behavioral science theories, self-efficacy, which is the individual's confidence in determining how well he or she can take the actions necessary to produce certain results,¹⁷⁻¹⁹ is a critical factor in people's ability to perform appropriate behavior.¹⁷⁻²⁵ In addition, one of the most important elements in enhancing self-efficacy is active mastery experience.¹⁹ Therefore, the findings of this study may indicate that experienced dentists with previous success in the treatment of patients with severe TMD-related pain have the enhanced self-efficacy to avoid performing occlusal adjustment, as an appropriate behavior.

Concerning the use of splints, the most commonly recommended splint was a hard acrylic custom stabilization splint. This result was consistent with those of the US DPBRN study.¹ The Japanese clinical guideline for the initial treatment of TMD patients proposes the recommendation that "For masticatory muscle pain patients, we recommend the use of a maxillary stabilization splint (a thin and full occlusal coverage appliance made from hard acrylic resin) (Grade 2C)."⁴ This recommendation is consistent with this present study result.

Concerning the types of medication reported in this study, prescription medication using loxoprofen sodium or diclofenac sodium was predominant, whereas OTC medication was rarely used. JDPBRN dentists frequently prescribed loxoprofen sodium (37.9%) and diclofenac sodium (8.5%). In contrast, the previous US DPBRN study results revealed that OTC medication was more prevalent than prescription medication in the US. The drug most frequently recommended by US DPBRN dentists was ibuprofen, in most cases purchased OTC (56%), and less frequently as prescribed ibuprofen (16%). The OTC medication system in Japan differs from that in the US due to differences in healthcare systems. Nevertheless, patients with TMD-related pain generally received NSAIDs (non-steroidal anti-inflammatory drugs) as medication in both Japan and the US.

Concerning self-care, "Avoid clenching or grinding teeth" was the most commonly recommended (75.0%), followed by "Relax your jaw (muscles) (64.8%)" and "Identify pain triggers (59.8%)". Although, in general, the types of self-care instruction for TMD-related pain may differ in accordance with patients characteristics, dentists in this study used fewer components of self-care usually or always recommended for patients compared with US DPBRN dentists, except for the "Relax your jaw (muscles) (64.8%)" component and the "Chew food on both sides of your back teeth at the same time (27.6%)" component.¹

Finally, 35% of dentists in the previous US DPBRN study used referral to physical therapists¹ versus only 4.7% of the dentists in this study. This disparity in the collaboration with physical therapists might be due to differences in healthcare systems and inter-

professional education, suggesting that active inter-professional cooperation between dentists and physical therapists is more prevalent in the US.

The main strength of this study is that use of the same questionnaire as that used in previous study¹ allowed the results to be compared internationally. Several limitations of the study also warrant mention. First, since the results were based on dentists' self-reported answers, a degree of information bias may be present. Data regarding patient characteristics derived from dentist memory might have been subject to recall bias. Second, participants were not selected randomly, but rather responded to a request for participation in the JDPBRN. In addition, in contrast to the previous US study¹, which included several dental practice-based research networks and 862 dentists, the present study was based on responses from 113 dentists. Nevertheless, the participants covered a reasonably wide diversity of dental care, and came from all seven regions of Japan. Age and sex distributions in the study sample reflected the actual distribution of dentists in Japan (80% male, average age in the 40s),²⁶ supporting the generalizability of the findings.

CONCLUSIONS

Most of the JDPBRN dentists used similar diagnostic protocols, including questionnaires and examinations, to diagnose TMDs. The most-commonly used treatments were splints or mouthguards, medications, and self-care. Over half of the participants indicated that they would perform occlusal adjustment for TMD-related pain. There were significant associations between the decision to perform occlusal adjustment and lack of therapeutic confidence in curing TMD-related acute pain and the proportion of patients with severe TMD-related pain. An evidence-practice gap may exist between the clinical guideline and actual practice regarding occlusal adjustment for TMD-related pain. This gap may be ameliorated by conducting further studies about what harm or benefit results from occlusal adjustment, especially as the first choice in trying to solve TMD problems with pain. Then treatment recommendations on this controversial topic can be based on sound clinical evidence to guide the clinician to provide the best evidence-based treatments for their patients.

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Table 1

Distribution of dentist, practice and patient characteristics of participants (n=113)

	Number (%) or Mean±SD
Dentist characteristics	
Years since graduation from dental school (year) * (n=107)	19.4±11.0
Gender (male), N (%) (n=110)	92 (83.6)
Race/ethnicity (Asian), N (%) (n=110)	110 (100)
Number of dentists who treated TMDs over the last 12 month * (n=110)	89 (80.9)
Number of patients with TMD-related pain per month * (n=89)	1.9±1.8
Therapeutic confidence in curing patients with TMD-related acute pain within 6 months of onset (n=89)	
<i>Confident</i>	28 (31.5)
<i>Neither agree nor disagree</i>	39 (43.8)
<i>Not confident</i>	22 (24.7)
Practice setting	
Type of practice (n=87)	
<i>Employed by another dentist</i>	40 (46.0)
<i>Self-employed without partners and without sharing of income, costs, or office space</i>	35 (40.2)
<i>Other</i>	12 (13.8)
City population (government ordinance-designated city) (n=86)	34 (39.5)
Patient characteristics	
Symptoms reported by TMD pain patients	
<i>Jaw pain (n=88)</i>	60 (68.1)
<i>Problem with opening or closing the mouth (n=87)</i>	52 (59.8)
<i>TMJ noises (n=87)</i>	45 (51.7)
<i>Catching or locking of the jaw (n=87)</i>	33 (37.9)
<i>Facial pain (n=88)</i>	23 (26.1)
<i>Headache (n=88)</i>	14 (15.9)
<i>Earache (n=87)</i>	4 (4.6)
Percent of patients with TMD pain who have experienced TMD pain for 6 months or more (n=87)	26.3±21.2
Severity of TMD-related pain (%) (n=88)	
<i>Mild</i>	55.5±24.1
<i>Moderate</i>	33.7±19.1
<i>Severe</i>	10.7±11.5
Patient age distribution * (n=87)	
<i>1–18 years old (%)</i>	14.3±8.7
<i>19–44 years old (%)</i>	28.2±12.3
<i>45–64 years old (%)</i>	30.5±10.6
<i>65+ years (%)</i>	27.5±14.5

* Mean± Standard Deviation (SD)

Table 2

Frequency of specific questions and examination items used by dentists to diagnose TMDs

	Usually/Always N (%)	Sometimes/half of time N (%)	Never N (%)
Questions			
<i>Do you have pain in your temples, face, jaw joint or jaws? (n=89)</i>	88 (98.9)	1 (1.1)	0 (0)
<i>Do you have pain when you open your mouth wide? (n=89)</i>	88 (98.9)	1 (1.1)	0 (0)
<i>Do you have pain when you chew? (n=89)</i>	79 (88.8)	9 (10.1)	1 (1.1)
<i>Do you have pain when you are clenching or grinding your teeth?(n=88)</i>	70 (79.5)	14 (15.9)	4 (4.5)
Examinations			
<i>Palpation of TMJ (n=87)</i>	84 (96.6)	3 (3.4)	0 (0)
<i>Palpation of jaw muscles (n=87)</i>	80 (92.0)	7 (8.0)	0 (0)
<i>Limited range of motion (n=87)</i>	80 (92.0)	5 (5.7)	2 (2.3)
<i>Presence of pain with range of motion (n=87)</i>	79 (90.8)	5 (5.7)	3 (3.4)
<i>TMJ noises (n=87)</i>	75 (86.2)	10 (11.5)	2 (2.3)
<i>Occlusal state (n=87)</i>	77 (88.5)	9 (10.3)	1 (1.1)

Table 3

Most frequently treatment provided by dentists for pain related to TMDs

	Number (%)
Treatment types * (n=85)	
<i>Splint or mouthguard</i>	82 (96.5)
<i>Over-the-counter (OTC) or prescribed Medications</i>	72 (84.7)
<i>Self-care</i>	59 (69.4)
<i>Jaw exercises</i>	50 (58.8)
<i>Occlusal adjustment</i>	49 (57.6)
<i>Referral to physical therapist</i>	4 (4.7)
<i>Other</i>	20 (23.5)

* Participants could select more than one treatment option

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Table 4

Type of self-care instruction, splints and medications recommended by dentists for treating pain related to TMDs

	Usually or Always N (%)	Sometimes or Half of time N (%)	Never N (%)
Type of splint			
<i>Hard custom mouthguard (n=85)</i>	34 (40.0)	40 (47.1)	11 (12.9)
<i>Soft custom mouthguard (n=83)</i>	16 (19.3)	35 (42.2)	32 (38.6)
<i>Anterior repositioning splint (n=79)</i>	3 (3.8)	9 (11.4)	67 (84.8)
<i>Soft over-the-counter mouthguard (n=78)</i>	1 (1.3)	1 (1.3)	76 (97.4)
<i>Noiceptive Trigeminal Inhibition appliance (NTI)(n=75)</i>	0 (0)	2 (2.7)	73 (97.3)
<i>Other (n=28)</i>	2 (7.1)	1 (3.6)	25 (89.3)
Type of medication			
Over the counter (OTC)			
<i>Acetaminophen (n=83)</i>	1 (1.2)	6 (7.2)	76 (91.6)
<i>Aspirin (n=83)</i>	0 (0)	3 (3.6)	80 (96.4)
<i>Ibuprofen (n=83)</i>	0 (0)	4 (4.8)	79 (95.2)
<i>Naproxen (n=83)</i>	0 (0)	1 (1.2)	82 (98.8)
<i>Loxoprofen Sodium (n=82)</i>	0 (0)	6 (7.3)	76 (92.7)
Prescription			
<i>Loxoprofen sodium (n=87)</i>	33 (37.9)	39 (44.8)	15 (17.2)
<i>Diclofenac sodium (n=82)</i>	7 (8.5)	30 (36.6)	45 (54.9)
<i>Ibuprofen (n=83)</i>	6 (7.2)	6 (7.2)	71 (85.5)
<i>Muscle relaxants (n=84)</i>	4 (4.8)	8 (9.5)	72 (85.7)
<i>Indomethacin (n=83)</i>	1 (1.2)	6 (7.2)	76 (91.6)
<i>Amfenac sodium (n=84)</i>	1 (1.2)	5 (6.0)	78 (92.9)
<i>Low-dose tricyclic antidepressants (n=82)</i>	0 (0)	2 (2.4)	80 (97.6)
<i>Naproxen (n=83)</i>	0 (0)	4 (4.8)	79 (95.2)
<i>Aspirin (n=84)</i>	0 (0)	9 (10.7)	75 (89.3)
<i>Tramadol (n=83)</i>	0 (0)	0 (0)	83 (100)
<i>Other opioids (n=83)</i>	0 (0)	0 (0)	83 (100)
Type of self-care instruction			
<i>Avoid clenching or grinding teeth (n=88)</i>	66 (75.0)	20 (22.7)	2 (2.3)
<i>Relax your jaw (muscles) (n=88)</i>	57 (64.8)	20 (22.7)	11 (12.5)
<i>Identify pain triggers (n=87)</i>	52 (59.8)	27 (31.0)	8 (9.2)
<i>Eat a pain-free diet (n=88)</i>	44 (50.0)	37 (42.0)	7 (8.0)
<i>Get a good night's sleep (n=88)</i>	32 (36.4)	34 (38.6)	22 (25.0)
<i>Eat a soft diet (n=88)</i>	31 (35.2)	46 (52.3)	11 (12.5)
<i>Keep your teeth apart (n=87)</i>	29 (33.3)	25 (28.7)	33 (37.9)
<i>Avoid biting objects (for example, pens)(n=88)</i>	29 (33.0)	36 (40.9)	23 (26.1)
<i>Avoid chewing gum (n=88)</i>	26 (29.5)	40 (45.5)	22 (25.0)
<i>Chew food on both sides of your back teeth at the same time (n=87)</i>	24 (27.6)	39 (44.8)	24 (27.6)

	Usually or Always N (%)	Sometimes or Half of time N (%)	Never N (%)
<i>Apply heat (n=87)</i>	16 (18.4)	41 (47.1)	30 (34.5)
<i>Avoid pushing your tongue against your teeth (n=87)</i>	15 (17.2)	29 (33.3)	43 (49.4)
<i>Avoid biting on your fingernails (n=88)</i>	19 (21.6)	32 (36.4)	37 (42.0)
<i>Avoid biting tongue/lip/cheek (n=88)</i>	14 (15.9)	38 (43.2)	36 (40.9)
<i>Place tongue gently on your palate (n=87)</i>	7 (8.0)	28 (32.2)	52 (59.8)
<i>Apply ice (n=85)</i>	3 (3.5)	34 (40.0)	48 (56.5)
<i>Avoid caffeine (n=88)</i>	0 (0)	16 (18.2)	72 (81.8)

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Table 5

Factors affecting dentist decision to perform occlusal adjustment for TMD-related pain (n=81)

Variable	OR	95% CI		p value
		Lower	Upper	
Gender (reference male)	2.45	0.560	10.691	.234
Years since graduation from dental school *	1.00	0.950	1.048	.939
Dentist confidence in curing TMD-related acute pain *				
Confident	1			
Neither agree nor disagree	0.76	0.239	2.437	.648
Not confident	5.60	1.260	24.861	.024
Proportion of patients with severe TMD-related pain *	0.95	0.909	0.999	.047
Number of TMD pain patients treated per month *	1.05	0.993	1.100	.092

OR, odds ratio

CI, confidence interval

Overall predictive accuracy is 66.7% in the model

* Continuous variable