

Dentist's distress in the management of chronic pain control

The example of TMD pain in a dental practice-based research network

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Abstract

We aimed to obtain greater understanding of dentists' distress when they diagnose and treat patients with temporomandibular disorders (TMD), and to explore ways in which TMD can be better treated.

We conducted a cross-sectional study based on a questionnaire survey of dentists (n = 148). Dentists were queried using an open-ended questionnaire about distress they experienced when treating patients with TMD. Survey responses were analyzed using mixed methods. Associations between specific dentist and patient characteristics and types of distress were analyzed by one way analysis of variance and residual analysis.

One hundred thirteen clinicians responded to the questionnaire, giving a 76% response rate. Thematic analysis identified 6 major themes: difficulty in predicting therapeutic effect and prognosis; difficulty in diagnosis; difficulty in the decision about whether to do occlusal adjustment; difficulty in specifying a cause; difficulty in communicating with patients and mental factors; and health insurance system barriers. Clinicians who reported difficulty in deciding whether to do occlusal adjustment saw significantly more patients who experienced shoulder stiffness and headache ($P = .008$ and $P = .022$, respectively). Dentists' knowledge of TMD guidelines was associated with a lower percentage of difficulty in predicting therapeutic effect and prognosis (residual analysis; $P = .010$).

These findings provide important insights into clinician's perception of difficulties with patients experiencing TMD-related pain. Knowledge of the existence of TMD clinical practice guidelines may lower dentist distress, particularly with regard to prognosis. Further studies are needed to decrease dentist's distress and to overcome the evidence-practice gap in TMD treatment.

Abbreviations: ANOVA = analysis of variance, JDPBRN = Dental PBRN Japan, PBRN = Practice-Based Research Network, SD = standard deviation, TMD = temporomandibular disorders.

Keywords: clinicians' distress, evidence-practice gap, mixed methods, pain, practice-based research, temporomandibular disorders

1. Introduction

Temporomandibular disorders (TMD) are among the most frequent musculoskeletal pain conditions, affecting around 5% to 12% of the US population^[1] and 3% of Japanese population.^[2] Long-standing controversy over the diagnosis and

treatment of TMD continues,^[3–6] and no initial management of TMD-related pain for general dentists has yet been standardized. A recent study by the National Dental Practice-Based Research Network (PBRN) and Dental PBRN Japan (JDPBRN) identified significant variation among practicing dentists regarding TMD-related pain.^[1] For example, 64% of US dentists^[1] and 58% of

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Japanese dentists^[7] reported using occlusal adjustment, despite the fact that the clinical practice guideline^[8] recommends against occlusal adjustment as initial treatment for TMD because of its irreversibility and uncertainty over its effectiveness. These findings suggest the presence of an evidence-practice gap in clinical practice for TMD-related pain. These circumstances might lead to a worsening of the difficulties already experienced by dentists in the diagnosis and treatment of TMD. Previous studies suggest that TMD-related pain impacts patients' lives strongly and is connected with feelings of hopelessness and despair.^[9–11] A qualitative interview study revealed that dentists recognized that psychological factors play an important role in the development and maintenance of TMD-related pain and felt inadequately equipped to manage this condition.^[12] A previous study suggested that about 50% of dentists felt insecure concerning TMD diagnostics, therapy decisions and treatment, and there is high need for offering continuing education in TMD.^[13] A systematic review suggested that understanding clinicians' perceived barriers or misperception is important in bridging the evidence-practice gap, and that identifying these factors is better done using qualitative methods.^[14]

To our knowledge, however, dentist distress regarding TMD-related pain has not been evaluated. Understanding this distress may aid in bridging the evidence-practice gap. Therefore, the objectives of this study were to evaluate dentist distress when seeing patients with TMD-related pain qualitatively and identify specific characteristics that are significantly associated with dentist distress quantitatively.

2. Methods

2.1. Study design

The study was conducted using a cross-sectional design based on a questionnaire survey that used mixed methods integrating both quantitative and qualitative data in the study.^[15] Approval was obtained from the Institutional Review Board of Kyushu Dental University (No. 13-73) and the study was conducted in accordance with the World Medical Association Declaration of Helsinki. Participants were provided informed consent prior to participation.

2.2. Participants

The study evaluated dentists working in outpatient dental practices and affiliated with the JDPBRN ($n=148$). The JDPBRN is a research network and consortium of dental practices with a broad representation of practice types, treatment philosophies, and patient populations, and has a shared mission with the DPBRN,^[16] now called the National Dental PBRN (<http://NationalDentalPBRN.org>). Participants were enrolled via the JDPBRN website (<http://www.dentalpbrn.jp/>) and a targeted mail campaign. The JDPBRN network regions cover all 7 major districts of Japan, namely Hokkaido, Tohoku, Kanto, Chubu, Kansai, Chugoku-Shikoku, and Kyushu. Each of these regions has a Regional Coordinator, who was tasked with distribution and collection of the questionnaires. Participants completed the questionnaire themselves and mailed it to the Regional Coordinator using a preaddressed envelope. On receipt, the Regional Coordinator reviewed all questionnaires for completeness.

2.3. Questionnaire

Participating dentists were asked about their own and their patients' demographic information. They were also asked about difficulties

experienced by patients in their practice who have TMD pain, such as “cannot eat,” “fear of not being able to open the mouth,” and “shoulder stiffness and headache”; duration of TMD-related pain in their patients; and dentist awareness of the existence of TMD practice guidelines or experience of having read them. In addition, participants were asked about their biggest difficulties when seeing patients with TMD-related pain in an open-ended questionnaire survey. The final version of this questionnaire is available at <http://www.dentalpbrn.jp/image/study2questionnaire.pdf>.

2.4. Qualitative analysis

Participants were asked to describe their opinions regarding “What is the most distressing aspect for you when you treat patients with TMD-related pain?” in a free answer method. Dentist distress on seeing patients with pain related to TMD was analyzed using thematic analysis, as described by Braun and Clarke.^[17,18] Briefly, thematic analysis consists of 6 phases: familiarization with the data, coding, searching for themes, reviewing themes, defining and naming themes, and writing-up the results.^[18] All processes were actively discussed among 2 epidemiologists and 2 dentists.

2.5. Quantitative analysis (statistical analysis)

A descriptive analysis was conducted, and the results were expressed in terms of the mean, standard deviation (SD), and frequency. We determined the numbers (percentage) of JDPBRN dentists and patients' demographics. One-way analysis of variance (ANOVA) and residual analysis were then conducted to examine the relationship between independent variables and the dentists' distress theme as a dependent variable. The post hoc test (Fisher–Hayter test) was conducted when the results of one way ANOVA were statistically significant. Independent variables were gender, age, percentage of clinicians who knew of the guideline, percentage who had read the guideline, patients with severe TMD-related pain, number of TMD pain patients treated per month, difficulties experienced by patients and duration of pain. Statistical significance was set at $P<.05$. All statistical analyses were performed with STATA/SE (version 13; STATA Corporation, College Station, TX).

3. Results

3.1. Demographic information of participants

Questionnaires were provided to 148 dentists, and 113 (76%) responses were received. Demographic characteristics are shown in Table 1. Mean age (SD) was 44 ± 11 . Participants were mainly male ($N=92$, 84%), and were all Asian by race or ethnicity. Respondents reported that their patients experienced TMD difficulties that included shoulder stiffness (37.5%), headache (28.8%), cannot eat (22.7%), and fear of not being able to open the mouth (14.9%). Sixty-two (56.9%) dentists knew of the existence of the TMD practice guidelines and 44 (41.5%) had read them.

3.2. Dentist distress in the management of chronic pain control according to the thematic analysis

Thematic analysis of the freely descriptive data generated 6 themes, namely difficulty in predicting therapeutic effect and prognosis ($N=33$); difficulty in diagnosis ($N=22$); difficulty in the decision about whether to do occlusal adjustment ($N=16$); difficulty in specifying a cause ($N=13$); difficulty in communicating with patients and mental factors ($N=12$); and health

Table 1
Distribution of patient and dentist characteristics.

	Mean ± SD or number (%)
Characteristics of patients in the practice (number dentists reporting)	
Percentages of male (N=110)	42.6 ± 9.1
Percentages of each age group (N=110)	
1–18 (N=110)	26.4 ± 12.9
19–44 (N=110)	26.4 ± 12.9
45–64 (N=110)	30.6 ± 11.5
>65 (N=109)	28.3 ± 17.1
TMD patients who experience difficult symptoms, %	
Cannot eat (N=110)	22.7 ± 26.4
Fear of not being able to open mouth (N=111)	14.9 ± 18.2
Shoulder stiffness (N=110)	37.5 ± 27.1
Headache (N=109)	28.8 ± 23.2
Percentages of each duration of pain group	
<6 mo (N=94)	73.8 ± 22.3
≥6 mo (N=91)	27.1 ± 22.2
Characteristics of the dentist (number dentists reporting)	
Gender, male (%) (N=110)*	92 (84.0)
Age, y (N=110)	44.3 ± 11.1
Race/ethnicity (Asian) (n=110)*	110 (100.0)
Know of the guideline, yes (%) (N=109)*	62 (56.9)
Read the guideline, yes (%) (N=106)*	44 (41.5)
Number who treated TMD over the last 12 mo (n=110)*	89 (80.9)
Number of patients seen each month who have TMD-related pain (n=89)	1.9 ± 1.8

* Number (%).

SD=standard deviation, TMD=temporomandibular disorders.

insurance system barriers (N=1). These results are described in Table 2; each theme was supported by more than 12 mentions except theme 6. Since theme 6 was supported by only 1 mention, we excluded theme 6 from further quantitative analysis.

3.3. Factors associated with dentist distress in the management of chronic pain control

Factors affecting dentists’ distress in the management of chronic pain control are shown in Table 3. Patient and dentist characteristics were associated with the type of dentist distress in

management of chronic pain control. Clinicians who reported difficulties in deciding whether to do occlusal adjustment saw more patients who experience shoulder stiffness and headache (one way ANOVA, $P=.008$ and $P=0.022$, respectively). Dentists’ knowledge of the TMD guidelines was significantly associated with a lower percentage of dentist difficulties in predicting therapeutic effect and prognosis (residual analysis, $P=.010$).

4. Discussion

The results of this study identified 6 themes of dentists’ perceived distress when managing chronic pain control in TMD. One-way ANOVA and residual analysis suggested that both patient characteristics (such as difficulty with shoulder stiffness and headache) and dentist characteristics (such as knowing of the existence of TMD guidelines) were associated with dentist distress in the management of chronic pain control.

Thematic analysis extracted 6 dentist distress factors in the practice of TMD-related pain, including dentist and patient communication, etiology, diagnosis, treatment, prognosis, and social health insurance system. These results suggest that clinician distress occurs in many areas, including those at the patient level, dentist level, and social health insurance system level. As previously noted, psychological factors play an important role in the management of TMD-related pain,^[12] and our analysis also suggested that communication with patients who have psychological factors was difficult. Since TMD-related pain is multidimensional,^[19] difficulties in specifying specific causes have been reported. In addition, TMD-related pain is a long-term condition,^[19] and dentists felt distress in predicting its therapeutic effect and prognosis. Regarding the social health insurance system, as dentist diagnosis and treatment varies among different kinds of health insurance coverage,^[20–27] practice pattern could be largely influenced by the social insurance system.

This study also revealed dentists’ perceived distress over decisions surrounding occlusal adjustment. A previous study suggested that dentists feel inadequately equipped to diagnose or treat TMD-related pain, and that they recognized that psychological factors could play a role in the development and maintenance of TMD-related pain.^[12] Although the clinical practice guideline^[4] recommends that, because of the irreversible and uncertain nature of TMD, occlusal adjustment should not be

Table 2
Thematic analysis of dentist distress in the management of chronic pain control.

Theme	Participants’ quotes	Frequency of mention, N
Difficulty in predicting therapeutic effect and prognosis	What are the criteria for the cured state?	33
	It is not known if the disease can be cured	
Difficulty in diagnosis	When medication or treatment does not improve the pain	22
	When objective and subjective information do not match	
Difficulty in the decision about whether to do occlusal adjustment	When the chief complaint is ambiguous	16
	Even though it is suspected that occlusion may be the cause, it is difficult to decide whether proactive treatment such as adjusting dental occlusion or adjusting a defective prosthesis should be performed. The dentist hesitates to decide when the treatment may not cure the problem	
	Difficult to judge whether to observe the disease course or treat actively	
Difficulty in specifying a cause	There are a variety of causative factors, such as occlusion, parafunction, life background, and habit	13
Difficulty in communicating with patients and mental factors	Causes are not clear	12
	When the patient have psychosomatic problems and unidentified complaints	
	When the patient is not cooperative in treatment	
Health insurance system barriers	Some patients cannot understand explanations delivered over time in lay terms. It is difficult to treat patients who cannot understand	1
	We want to spend more time on the problem, but the health insurance system does not reimburse for this cost. Therefore, to what extent we should listen to the complaint is a problem	

Table 3**Factors associated with dentist distress.**

	Difficulty in predicting therapeutic effect and prognosis (N = 32)	Difficulty in diagnosis (N = 22)	Difficulty in deciding whether to do occlusal adjustment (N = 16)	Difficulty in specifying a cause (N = 13)	Difficulties in communication with patients and mental factors (N = 12)	P
Characteristics of patients in the practice						
Percentages of male, mean (SD)	24.8 (13.2)	27.0 (11.0)	35.0 (17.6)	29.2 (14.4)	18.8 (20.9)	.061*
Percentages of each age group, mean (SD)						
1–18	20.5 (24.3)	19.5 (21.8)	14.7 (14.1)	31.5 (19.2)	12.9 (10.5)	.165*
19–44	46.7 (18.8)	38.4 (19.4)	47.5 (22.4)	38.8 (13.7)	52.1 (15.9)	.184*
45–64	30.7 (20.9)	32.6 (22.5)	32.4 (22.8)	24.6 (14.7)	29.6 (14.2)	.840*
>65	7.0 (9.5)	13.3 (20.4)	9.7 (9.3)	8.2 (7.2)	6.5 (6.7)	.478*
Percentages of TMD patients who experience difficult symptoms, mean (SD)						
Cannot eat	19.5 (20.7)	19.0 (20.7)	25.9 (31.9)	25.4 (25.4)	32.5 (37.9)	.608*
Fear of not being able to open the mouth	13.9 (15.8)	10.0 (13.8)	25.0 (27.4)	15.0 (14.1)	12.1 (20.2)	.153*
Shoulder stiffness	27.8 ^{†,‡} (25.0)	33.2 (25.5)	51.5 [‡] (28.9)	36.5 (21.9)	54.2 [†] (27.5)	.008*
Headache	22.5 [†] (19.0)	25.2 (18.9)	42.0 [†] (31.0)	28.8 (20.2)	42.1 (27.9)	.022*
Percentages of each duration of pain group, mean (SD)						
< 6 mo	65.0 (23.5)	78.1 (16.6)	75.4 (27.6)	70.0 (24.9)	86.8 (13.1)	.063*
≥ 6 mo	35.0 (23.5)	21.9 (16.6)	26.8 (27.8)	30.0 (24.9)	14.5 (13.0)	.099*
Characteristics of the dentist						
Gender, male, N (%)	28 (84.9)	20 (90.9)	13 (81.3)	12 (92.3)	11 (91.7)	.865 [§]
Age, y, mean (SD)	42.7 (11.7)	46.5 (9.6)	39.9 (10.9)	47.0 (11.6)	41.8 (8.6)	.267*
Know of the guideline, yes, N (%)	11 (34.4)	18 (81.8)	10 (62.5)	6 (46.2)	8 (72.7)	.010[§]
Read guideline, yes, N (%)	6 (18.8)	11 (52.4)	7 (46.7)	6 (46.2)	6 (54.6)	.103 [§]

SD = standard deviation, TMD = temporomandibular disorders.

Bold indicate significant relationships.

* One-way analysis of variance.

†,‡ $P < .05$ by Fisher–Hayter pair-wise comparisons.

§ Benjamini and Hochberg adjusted chi-squared test.

|| $P < .05$ smaller than expected value by residual analysis¶ $P < .05$ larger than expected value by residual analysis.

performed as initial treatment, as many as 64% of US and 58% of Japanese dentists initially use occlusal adjustment in their practice.^{11,71} This apparent evidence-practice gap in occlusal adjustment may cause dentist distress over decisions about this treatment.

Additional quantitative analysis revealed that dentists' distress over occlusal treatment was related to the dentist having a higher percentage of patients who experienced shoulder stiffness and headache. Treatment of patients with TMD might be more difficult when they experienced additional problems such as shoulder stiffness and headache. For this reason, dentists may perceive greater difficulty in treatment decisions and tend to seek possibilities for the cure of TMD-related pain. Finally, they may try occlusal adjustment even if it is not recommended as a first choice. Previous research in Japan found that the most frequent symptoms accompanying TMD were shoulder stiffness (53.1%) and headache (25.2%).^{128]} This high prevalence of accompanying symptoms may be 1 reason for the high percentage of occlusal adjustment for TMD-related pain in Japan.

Dentists' distress over the management of chronic pain control may be because of a lack of knowledge, although this study did not assess the relationship between dentists' knowledge and their distress. Previous studies to assess knowledge of and beliefs about TMD were conducted in several countries.^{129–32]} In one study, the subject dentists mostly agreed with TMD experts regarding the “etiology” domain, but did not agree with them in the areas of “pathophysiology, diagnosis, and treatment,” and lacked knowledge of these areas.^{133]} However, another study pointed out that dentist knowledge of TMD was lowest among the 4 domains of etiology, signs and symptoms, diagnosis, and treatment.^{132]} These results suggest that dentists' knowledge variation exists. In our study, we found

a relationship between dentist recognition of the existence of the TMD guideline and lower distress on prognosis, which may suggest that greater knowledge of TMD-related pain could lower dentists' prognostic distress, which had the highest percentage of all 6 distresses. Although our results did not show a significant association between experience with reading the guidelines and lower dentist distress, the association was in the same direction as knowledge of the existence of the guidelines. Further studies are needed to clarify the relationship between the clinical guidelines and clinician distress in the management of chronic pain.

The main strength of this study is its use of mixed methods (qualitative and quantitative analysis). Qualitative analysis is suitable for exploratory clarification of this phenomenon. Also, this study clarified factors associated with the themes revealed by quantitative analysis. A limitation of this study regarding selection bias also warrants mention. The subjects were not a random selection, but instead were responders to a recruitment request in the JDPBRN. Nevertheless, the subjects represented a reasonably diverse range of dental care from the 7 major geographical areas of Japan. Distributions by age and sex were consistent with the distribution of Japanese dentists, namely 80% men with an average age in the 40s.^{134]} These characteristics support the generalizability of our results. Other limitations exist regarding unmeasured variables, such as the seniority of dentists or their psychological factors like personal distress tolerance and practicing in different social insurance systems, which may independently influence the dentist distress on the management of TMD-related pain. Finally, the results of this study may generalize only to Japan. Diverse practice guidelines and dentists' practice patterns may make the results less generalizable to other countries.

5. Conclusion

Against the controversial background of an evidence-practice gap in the treatment of patients with TMD, we identified 6 themes of dentists' distress in the management of chronic pain control of TMD. The percentage of patients in their practice who experienced difficult symptoms was associated with higher dentists' distress in decision making for occlusal treatment. Further, dentist awareness of the existence of TMD clinical practice guidelines may lower dentist distress, particularly with regard to prognosis. Further studies to lower dentist distress and to fill the evidence-practice gap in TMD treatment are needed.

References

- [1] Velly AM, Schiffman EL, Rindal DB, et al. The feasibility of a clinical trial of pain related to temporomandibular muscle and joint disorders: the results of a survey from the Collaboration on Networked Dental and Oral Research dental practice-based research networks. *J Am Dent Assoc* 2013;144:e1–0.
- [2] Ministry of Health, Labour and Welfare. Survey of Dental Diseases. Available from: <http://www.mhlw.go.jp/toukei/list/dl/62-17c23-1.pdf>. Accessed January 8, 2017.
- [3] Greene CS, Mohl ND, McNeill C, et al. Temporomandibular disorders and science: a response to the critics. *Am J Orthod Dentofacial Orthop* 1999;116:430–1.
- [4] Goldstein BH. The TMD controversies continue. *J Can Dent Assoc* 1999;65:47–8.
- [5] Shulman J. TMD controversy continues. *J Calif Dent Assoc* 2015;43:702.
- [6] Jenkins DN. TMD: the great controversy. *J Calif Dent Assoc* 2014;42:518–20.
- [7] Kakudate N, Yokoyama Y, Sumida F, et al. Dentist practice patterns and therapeutic confidence in the treatment of pain related to temporomandibular disorders in a dental practice-based research network. *J Oral Facial Pain Headache* 2017;31:152–8.
- [8] Yuasa H, Kino K, Kubota E, et al. Primary treatment of temporomandibular disorders: the Japanese Society for the temporomandibular joint evidence-based clinical practice guidelines, 2nd edition. *Jpn Dent Sci Rev* 2013;49:89–98.
- [9] Durham J, Exley C, John MT, et al. Persistent dentoalveolar pain: the patient's experience. *J Orofac Pain* 2013;27:6–13.
- [10] Durham J, Steele JG, Wassell RW, et al. Living with uncertainty: temporomandibular disorders. *J Dent Res* 2010;89:827–30.
- [11] Wolf E, Birgerstam P, Nilner M, et al. Nonspecific chronic orofacial pain: studying patient experiences and perspectives with a qualitative approach. *J Orofac Pain* 2008;22:349–58.
- [12] Peters S, Goldthorpe J, McElroy C, et al. Managing chronic orofacial pain: a qualitative study of patients', doctors', and dentists' experiences. *Br J Health Psychol* 2015;20:777–91.
- [13] Lindfors E, Tegelberg Å, Magnusson T, et al. Treatment of temporomandibular disorders—knowledge, attitudes and clinical experience among general practising dentists in Sweden. *Acta Odontol Scand* 2016;74:460–5.
- [14] Slade SC, Kent P, Patel S, et al. Barriers to primary care clinician adherence to clinical guidelines for the management of low back pain: a systematic review and metasynthesis of qualitative studies. *Clin J Pain* 2016;32:800–16.
- [15] Creswell JW. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. 4th ed. Thousand Oaks: SAGE Publications; 2013.
- [16] Gilbert GH, Williams OD, Rindal DB, et al. The creation and development of the Dental Practice-Based Research Network. *J Am Dent Assoc* 2008;139:74–81.
- [17] Braun V, Clarke V. What can “thematic analysis” offer health and wellbeing researchers? *Int J Qual Stud Heal* 2014;9:26152.
- [18] Clarke V, Braun V. Teaching thematic analysis. *Psychologist* 2013;26:120–3.
- [19] Zakrzewska JM. Multi-dimensionality of chronic pain of the oral cavity and face. *J Headache Pain* 2013;14:37.
- [20] Kakudate N, Sumida F, Matsumoto Y, et al. Restorative treatment thresholds for proximal caries in dental PBRN. *J Dent Res* 2012;91:1202–8.
- [21] Kakudate N, Sumida F, Matsumoto Y, et al. Patient age and dentists' decisions about occlusal caries treatment thresholds. *Oper Dent* 2014;39:473–80.
- [22] Kakudate N, Sumida F, Matsumoto Y, et al. Dentists' decisions to conduct caries risk assessment in a Dental Practice-Based Research Network. *Community Dent Oral Epidemiol* 2015;43:128–34.
- [23] Yokoyama Y, Kakudate N, Sumida F, et al. Dentists' dietary perception and practice patterns in a dental practice-based research network. *PLoS ONE* 2013;8:e59615.
- [24] Yokoyama Y, Kakudate N, Sumida F, et al. Evidence-practice gap for in-office fluoride application in a dental practice-based research network. *J Public Health Dent* 2016;76:91–7.
- [25] Yokoyama Y, Kakudate N, Sumida F, et al. Evidence-practice gap for dental sealant application: results from a dental practice-based research network in Japan. *Int Dent J* 2016;66:330–6.
- [26] Gordan VV, Bader JD, Garvan CW, et al. Restorative treatment thresholds for occlusal primary caries among dentists in the dental practice-based research network. *J Am Dent Assoc* 2010;141:171–84.
- [27] Riley JLIII, Gordan VV, Ajmo CT, et al. Dentists' use of caries risk assessment and individualized caries prevention for their adult patients: findings from The Dental Practice-Based Research Network. *Community Dent Oral Epidemiol* 2011;39:564–73.
- [28] Watanabe EK, Yatani H, Kuboki T, et al. The relationship between signs and symptoms of temporomandibular disorders and bilateral occlusal contact patterns during lateral excursions. *J Oral Rehabil* 1998;25:409–15.
- [29] Just JK, Perry HT, Greene CS. Treating TM disorders: a survey on diagnosis, etiology and management. *J Am Dent Assoc* 1991;122:55–60.
- [30] Glaros AG, Glass EG, McLaughlin L. Knowledge and beliefs of dentists regarding temporomandibular disorders and chronic pain. *J Orofac Pain* 1994;8:216–22.
- [31] Lee WY, Choi JW, Lee JW. A study of dentists' knowledge and beliefs regarding temporomandibular disorders in Korea. *Cranio* 2000;18:142–6.
- [32] Baharvand M, Sedaghat Monfared M, Hamian M, et al. Temporomandibular disorders: knowledge, attitude and practice among dentists in Tehran, Iran. *J Dent Res Dent Clin Dent Prospects* 2010;4:90–4.
- [33] Le Resche L, Truelove EL, Dworkin SF. Temporomandibular disorders: a survey of dentists' knowledge and beliefs. *J Am Dent Assoc* 1993;124:90–4.
- [34] Ministry of Health Labour and Welfare. Survey of Physicians, Dentists and Pharmacists: Trends in the number of dentists, 2010. Available from: http://www.mhlw.go.jp/toukei/saikin/hw/ishi/10/dl/kekka_2.pdf. Accessed January 8, 2017.