

ASSESSMENT OF KNOWLEDGE ON TEMPOROMANDIBULAR DISORDERS AMONG MEXICAN DENTAL EDUCATORS

Irene A. Espinosa¹, Edgar M. Pérez¹, Yoly M. Gonzalez², Alejandro Corona³

¹ School of Stomatology, Benemerita Universidad Autonoma de Puebla, México

² Department of Oral Diagnostic Sciences, State University New York at Buffalo, USA

³ Undergraduate Student in Psychology, State University New York at Buffalo, USA

ABSTRACT

Temporomandibular disorders (TMDs) is an umbrella term that embraces a group of musculoskeletal and neuromuscular conditions that involve the temporomandibular joints, muscles and all associated tissues. Because of the relatively high number of patients with TMDs in the population, instruction in this area of health care should be included on all dental curricula. Although levels of knowledge among dentists have been evaluated in several countries, they have not been in Mexico. This study evaluates the dental faculty's range of knowledge about TMD at five dental schools in Puebla, Mexico.

Using an observational design, a survey was administered to 161 educators in order to assess their knowledge of TMD. Four domains were assessed, including: a) pathophysiology; b)

psychophysiology; c) psychiatric disorders; and d) chronic pain. Overall knowledge of TMD was measured using a consensus of TMD experts' answers as a reference standard. The results show that educators' overall knowledge had 55% agreement with the reference standard. Individually, the psychophysiological domain was correctly recognized by 77.7% of the educators; correct responses on the other domains ranged from 38% to 56%. This study demonstrates the need to incorporate standardized TMDs instruction into the dental curricula at Mexican Universities, without which graduating dentists will lack the necessary knowledge or experience to diagnose and manage their TMD patients.

Key words: Temporomandibular joint disorders; dental education; teaching.

EVAUACIÓN DEL CONOCIMIENTO SOBRE TRASTORNOS TEMPOROMANDIBULARES EN DOCENTES DE ODONTOLOGÍA EN MÉXICO

RESUMEN

Los Trastornos Temporomandibulares (TTM) incluyen un grupo de condiciones musculoesqueléticas y neuromusculares que afectan a la Articulación Temporomandibular (ATM), los músculos masticadores y otros tejidos asociados.

Debido al número relativamente alto de pacientes con TTM en la población, la educación en esta área de la salud debe ser incluida en las currículas de las escuelas de odontología.

A pesar de que el nivel de conocimiento sobre TTM ha sido evaluado en diversos países, esto no ha sido realizado en México, por lo que el objetivo del presente estudio fue evaluar el nivel de conocimiento sobre los TTM de los profesores de odontología en cinco universidades de Puebla, México.

Bajo un diseño observacional, se administró una encuesta a 161 docentes de odontología para evaluar el nivel de conocimiento sobre los TTM. La encuesta incluyó cuatro dominios: a) patofisiología; b) psicofisiología; c) trastornos psiquiátricos y d) dolor crónico. Se usaron las respuestas

otorgadas con un consenso de expertos como estándar de referencia¹ para evaluar el nivel global de conocimiento sobre los TTM. Los resultados mostraron que los docentes tuvieron un nivel global de conocimiento del 55% de acuerdo al estándar de referencia. El dominio psicofisiológico individualmente fue el mejor reconocido con el 77% de acuerdo con los expertos; las respuestas correctas en los otros dominios oscilaron entre el 38% y el 56%. El presente estudio demostró la necesidad de incorporar educación sobre los TTM estandarizada en la currícula de las escuelas o facultades de odontología en las universidades mexicanas. Hasta que esto suceda, las generaciones de odontólogos no tienen el conocimiento ni la experiencia necesarios para diagnosticar y manejar a los pacientes con Trastornos Temporomandibulares.

Palabras clave: Trastornos Temporomandibulares; educación dental; enseñanza.

INTRODUCTION

Temporomandibular disorders are recognized by the American Association of Dental Research (AADR) as a collective term that embraces a group of musculoskeletal and neuromuscular conditions

that involve the temporomandibular joints, the muscles and all associated tissues². TMDs have been identified as a major cause of non-dental pain in the orofacial region and are considered to be a sub-classification of musculoskeletal disorders³. It

has been speculated that the onset of TMD is complex and multifactorial, and such factors have been classified as predisposing, precipitating and perpetuating⁴.

The reported prevalence of TMD, according to population-based studies, ranges from 6.3% to 15% in women and 2.8% to 10% in men. TMD conditions have been found to have an age-specific pattern, peaking at 35 to 45 years of age⁵⁻¹⁰. Studies have shown that the prevalence of signs or symptoms associated to TMD can be observed in up to 50% of the general population, of which only 3% to 7% seek professional help, depending on the severity of their symptoms⁵. Additionally, it has been demonstrated that patients with more than one TMD diagnosis have a greater chronicity as well as greater psychosocial involvement¹⁰⁻¹³.

In the United States, there have been several attempts to improve education in this field. Since 1990, the First Educational Conference to Develop the Curriculum in Temporomandibular Disorders and Orofacial Pain proposed several curriculum models specifically for predoctoral, postdoctoral, and continuing education¹⁴⁻²². A second educational conference was held in 1992, at which the educational methodologies for the implementation of formal curriculum guidelines in dental education, problem-based learning, decision analysis, and computer technology were discussed²³. Finally, in 2000, the Third Educational Conference was held, sponsored by the American Academy of Orofacial Pain, the Association of University TMD and Orofacial Pain Programs, the American Academy of Oral Medicine, the Canadian Academy of Oral and Maxillofacial Pathology and Oral Medicine, and the Association of Canadian Faculties of Dentistry. Over 130 educators participated with the goal of improving the teaching of TMD and OFP at predoctoral level^{23,24}.

Today, TMDs are being studied and treated with a medical perspective that involves orthopedic principles combined with a biopsychosocial understanding of how chronic pain disorders affect those who suffer them^{25,26}. Despite this progress, there are still controversies among those in the field of dental and advanced dental education. LeResche *et al.*¹ evaluated the extent of knowledge of TMD in a random sample of general dentists and TMD specialists. They reported that practicing dentists tended to agree with the opinion of experts on

psycho-physiological aspects, but they generally disagreed on issues related to the domain of pathophysiology. The study concluded that there is a high degree of consensus in knowledge among specialists and general dentists on some items; however, there is a need to reach a more consistent consensus among all domains.

Based on the information presented above, there is no doubt that teaching TMD should be a fundamental component of the dental curriculum, not only at the didactic level, but also incorporated into the student's clinical experiences, which influence knowledge and skills for treating TMD patients^{13,15,26,27-32}. As far as we know, there is no published study evaluating the knowledge of dental educators or clinicians in the area of TMD in Mexico. Therefore, the aim of this study was to evaluate knowledge of TMD among dental educators at five dental schools in Puebla, Mexico.

MATERIALS AND METHODS

An observational, cross-sectional study was conducted on 161 dental educators from five, out of a total of twenty-one, dental schools in the city of Puebla, Mexico. All twenty-one universities were invited to participate, but only 5 accepted to participate voluntarily and obtained approval from the relevant institutions. A published survey conducted in Seattle was used as reference¹ in which thirteen researchers who publish extensively in the refereed TMD literature formed the TMD expert group. These experts belonged to the International Association for Dental Research (IADR) and/or the International Association for the Study of Pain (IASP), and all had extensive clinical and/or research experience with TMD patients. The Seattle study was translated and adapted by an expert panel into Spanish. This survey consisted of 35 items divided into four domains: a) pathophysiology: assessing knowledge of biomedical or biomechanical aspects of TMD etiology, diagnosis and treatment, b) psychophysiology: assessing knowledge of the interaction of physical and psychological factors in TMD etiology, diagnosis and treatment, c) psychiatric disorders: assessing knowledge about anxiety, depression and somatization disorders associated with TMD, and d) chronic pain: assessing knowledge about the causes, diagnosis and appropriate treatment of chronic pain conditions as applied to TMD, according with survey proposal by LeResche *et al.*¹.

In the original Seattle study, the statements were evaluated by panels of experts. The expert responses used in the Seattle study were also used for the present study. The statements were said to generate expert consensus if more than 75% of the experts in the designated group endorsed an “agree” response (scored 7 to 10) or a “disagree” response (scored 0 to 3).

The answers were considered “correct” if the response matched the reference standard or response provided by the consensus of TMD experts. Otherwise, the responses were considered “incorrect”, even those in which the participants answered “I don’t know”.

All the participants answered the survey at their respective institutions in the presence of the researcher.

Statistical Analysis

Descriptive statistics including mean, median, standard deviation (SD), and percentages are presented. In addition, the median percentage of correct responses for each domain and total instrument scores were calculated. Comparisons by

gender and by year of graduation from dental school were performed using the Mann-Whitney test. Comparison by academic level was performed using the Kruskal Wallis test. A significance α level of 0.05 was used. SPSS version 17 was used for the statistical analysis. The dependent variable was TMD knowledge in dental educators. The independent variables were: gender, academic level, and year of graduation.

RESULTS

A total 161 dental educators participated in this study. Mean age was 40 years with a standard deviation of 10 years. Gender distribution was 55% female and 45% male. Regarding academic level, 24% were general dentists, 37% had a clinical specialty (not specifically TMD), and 39% had either an MS or PhD degree.

In the first domain (pathophysiology), the median percentage of correct responses by dental educators was 38% (Table 1). Within this domain, the item with the lowest rate of correct responses was “Occlusal equilibration is a useful early treatment for TMD”, for which only 2,5% of educators had

Table 1: Pathophysiology Domain.

Items	Expert Response	Right answer according Expert
1. Balancing interferences are commonly related to TMD.	<i>Disagree</i> 85%	14.3%
2. Occlusal equilibration is a useful early treatment for TMD.	<i>Disagree</i> 85%	2.5%
3. Orthodontic treatment can prevent the onset of TMD.	<i>Disagree</i> 77%	21.1%
4. Arthroscopic surgery is almost completely effective in repositioning the disc in patients with internal derangements.	<i>Disagree</i> 100%	38.5%
5. Orthodontic therapy is the best treatment to resolve TMD in a patient with a skeletal malocclusion.	<i>Disagree</i> 92%	65.8%
6. TMD caused by trauma is much more difficult to treat and has far worse prognosis than other types of TMD.	<i>Disagree</i> 83%	54.7%
7. Transcranial films are the most accurate method for viewing the TM Joint.	<i>Disagree</i> 77%	50.9%
8. The presence of arthritic changes on tomograms, along with crepitus in the joint indicates the need for treatment.	<i>Disagree</i> 77%	18.0%
9. The position of the condyle in the fossa as seen in tomograms is a very accurate indication of internal derangement.	<i>Disagree</i> 92%	40.4%
10. Mandibular repositions splints are more effective than maxillary splints.	<i>Disagree</i> 100%	45.3%
11. Nocturnal bruxism is caused by occlusal interferences.	<i>Disagree</i> 85%	67.7%
12. Ice packs and/or heat packs and passive muscle stretching are good early treatments for TMD.	<i>Agree</i> 100%	58.4%
13. All individuals with clicking TMJs require treatment.	<i>Disagree</i> 100%	36.0%

Median percentage of right answers according to experts = 38.4

adequate knowledge. The item with the highest number of correct responses in the same domain was “Nocturnal bruxism is caused by occlusal interferences”, for which 68% of educators had adequate knowledge. This particular domain presented a wide range of variability.

In the second domain (psychophysiology), dental educators had better knowledge of the subject, and the median percentage of total correct answers was 78% (Table 2). Within this domain, the item with the lowest rate of correct answers was “Stress is a major factor in the development of TMD”, with only 47% of the educators demonstrating adequate knowledge. The item with the highest percentage of correct answers was “Stress management is indicated for many TMD patients”, with 88% of the educators having adequate knowledge.

In the third domain (psychiatric disorders), the median percentage of total correct answers by dental educators was 50% (Table 3). The item with

the lowest rate of correct answers was “Clinical depression is rare in chronic TMD patients”, with only 47% of educators having adequate knowledge. The item with the highest percentage of correct answers in this domain was “Depression can be an important etiologic factor in chronic pain”, with 62% of educators demonstrating adequate knowledge.

Finally, in the fourth domain (chronic pain), the median percentage of correct answers was 56% (Table 4). Within this domain, the item with the lowest rate of correct answers was “Prescription of narcotics, as needed for pain as treatment of choice when TMD pain is severe”, where only 26% of the participants had adequate knowledge. The item with the highest rate of correct answers in this domain was “Behavior modification treatments are appropriate for patients with chronic TMD pain”, where 63% of dental educators agreed with experts on TMD.

Table 2: Psychophysiological Domain.

Items	Expert Response	Right answer according Expert
1. The mechanisms of acute and chronic pain are the same.	<i>Disagree</i> 100%	79.5%
2. Biofeedback can be useful for treating TMD.	<i>Agree</i> 100%	65.2%
3. Oral parafunctional habits are often significant in the development of TMD.	<i>Agree</i> 85%	72.7%
4. Patients with TMD who clench/brux do so either during the day or at night, but not both.	<i>Agree</i> 85%	72.7%
5. Stress management is indicated for many TMD patients.	<i>Agree</i> 77%	88.2%
6. Stress is a major factor in the development of TMD.	<i>Agree</i> 100%	46.6%
7. Tension and stress increase jaw muscle EMG levels in susceptible patients.	<i>Disagree</i> 82%	76.4%
8. Progressive muscle relaxation is not an effective treatment for TMD.	<i>Agree</i> 92%	54.0%
9. Information on the daily pattern of TMD symptoms can be helpful for identifying contributing factors.	<i>Disagree</i> 92%	79.5%
Median percentage of right answers according to experts = 77.7		

Table 3: Psychiatric Disorders Domain.

Items	Expert Response	Right answer according Expert
1. Clinical depression is rare in chronic TMD patients.	<i>Disagree</i> 100%	47.2%
2. Depressed mood is fair common in chronic TMD patients.	<i>Agree</i> 86%	52.8%
3. Anxiety disorders are more common in TMD patients than in the population at large.	<i>Agree</i> 79%	59.0%
4. Depression can be an important etiologic factor in chronic pain.	<i>Agree</i> 79%	62.1%
Median percentage of right answers according to experts = 50.0		

Table 4: Chronic Pain Domain.

Items	Expert Response	Right answer according Expert
1. Chronic TMD patients should be advised to rest and limit their work and social activities when they are experiencing pain.	<i>Disagree</i> 85%	46.6%
2. PRN narcotics (i.e., "as needed " for pain) are a treatment of choice when TMD pain is severe.	<i>Disagree</i> 93%	25.5%
3. Antidepressants are never indicated in the management of TMD.	<i>Disagree</i> 88%	49.1%
4. An extensive history of previous treatment failures in a TMD patient is usually an indication for surgery.	<i>Disagree</i> 100%	55.3%
5. Chronic pain is a behavioral as well as a physical problem.	<i>Agree</i> 96%	36.0%
6. Although some TMD patients have psychological problems, these problems are usually unrelated to their pain.	<i>Disagree</i> 85%	37.9%
7. Difficulty with sleep is a common finding in chronic pain.	<i>Agree</i> 96%	58.4%
8. Some patients use pain as an excuse to avoid unpleasant chores.	<i>Agree</i> 89%	60.9%
9. Behavior modification treatments are appropriate for patients with chronic TMD pain.	<i>Agree</i> 88%	63.4%

Median percentage of right answers according to experts = 55.5

Table 5: Comparison by gender.

Domain	Male (n=72) Median Correct Percentage	Female (n=89) Median Correct Percentage	p*
Pathophysiology	40.2	38.7	0.564
Psychophysiological	70.0	70.7	0.837
Chronic Pain	47.7	48.3	0.768
Psychiatric disorders	53.4	56.2	0.576
Across all domains	52.8	53.1	0.816

*U de Mann-Whitney

Comparison by gender (Table 5), year of graduation (Table 6), and academic level (Table 7) showed no statistically significant difference among groups ($p > 0.05$).

DISCUSSION

This research shows that participating dental educators' knowledge of TMD differs greatly from the knowledge of experts in TMD reported in the literature^{1,33}. Several countries have made efforts to assess knowledge of TMD among dentists^{1,25,31-36,38,39}. Researchers have shown that even among professionals with advanced education in TMD, there is no homogeneity of concepts on the pathophysiology of these conditions^{1,34,36-38}. In Mexico there is no specialty in TMD, and patients with this condition are treated by specialists in

different areas of stomatology and general dentists. This study represents the first evaluation conducted in Mexico, and clearly indicated the inconsistency of knowledge and understanding of these disorders, and consequently, the low priority that has been assigned to the field of TMD in dental education. We believe that this study highlights the need for dental educators to be prepared and teach the most updated knowledge in the field to their dental students.

Our results are consistent with data previously reported by several researchers. No difference was found by gender, academic level and year of graduation^{1,35}. This is also consistent with Glaros et al³³ who claims that general dentists and specialists in areas other than the TMD do not differ in knowledge about these disorders. However, other

Table 6: Comparison by time that the educators finished the last academic level.

Domain	Under 15 years (n=63) Median Correct Percentage	15 and over years (n=98) Median Correct Percentage	p*
	Median	Median	
Pathophysiology	38.4	38.4	0.932
Psychophysiological	66.6	77.7	0.084
Chronic Pain	55.5	49.9	0.926
Psychiatric disorders	50.0	50.0	0.856
Across all domains	52.6	55.0	0.531

*U de Mann-Whitney

Table 7: Comparison by academic level.

Domain	General Dentists	Dental Specialists	Dentists with MD/PHD	p*
	Median Correct Percentage			
Pathophysiology	39.4	41.4	37.5	0.369
Psychophysiological	68.3	71.4	70.8	0.676
Chronic Pain	50.2	46.0	48.6	0.526
Psychiatric disorders	62.5	52.5	52.7	0.275
Across all domains	54.6	52.5	52.3	0.635

*Kruskal Wallis

authors have found controversial results, with specialists obtaining better scores³⁴. Our data are also consistent with previously reported results on the pathophysiological domain, representing the lowest rate of 38%^{1,33,35,38}. The results illustrate a poor understanding of the etiology, diagnosis, and treatment of TMD. Our research showed the greatest weakness (only 2.5% of correct answers according to the experts) is in the belief that occlusal balance is a useful option in early treatment of temporomandibular disorders. Occlusal equilibrations are still being used in Mexico for the early management of patients with TMD, despite the vast worldwide evidence against such treatment. This particular finding contrasts with values from other previously reported studies in which the percentage of agreement of general dentists and other specialists was about 30% and 26%^{1,33}. On the other hand, the correct percentage, according to the experts in this research, about the statement “orthodontic treatment can prevent TMD” (21%), was slightly lower in studies by Glaros et al³³ (19%) and Le Resche¹(14%), although all results are low.

Conversely, it is noteworthy that the domain of psychophysiology (mechanisms of acute and chronic pain, biofeedback, oral parafunctional habits, stress, etc.) in the etiology of temporomandibular disorders was well recognized by the participants (78%). This highlights the understanding of most educators of the role of psychophysiological factors in the field of TMD. Previous studies^{1,33} have shown correct knowledge of this domain in 50% to 90% of general dentists and other specialists, consistent with the results of our study (46% to 88%). With respect to the domain of psychiatric disorders, our study has found that depression and anxiety are recognized as determining factors in patients with TMD, with 52% to 62% of participants answering those items correctly. Studies by Le Resche¹ and Glaros³³ found success rates higher than those reported in our study. Finally, domain analysis of chronic pain denotes that participants have acceptable knowledge of said domain (55%). However, issues such as “PRN narcotics (i.e., “as needed” for pain) are a treatment of choice when TMD pain is severe” and “Chronic pain is a behavioral as well as a

physical problem”, remain poorly understood by participants.

Despite the high prevalence of TMD reported in the literature, knowledge of TMD among dental educators needs improvement, as previous studies have reported^{1,33,34,37,38}. The results denote a high level of variability in the domain of the

pathophysiology diagnosis and treatment as well as a need to improve in the other domains. Knowledge among educators is not influenced by gender, academic level, or year of graduation. These results support the conclusion that there is an important need for improvement in the knowledge of TMD in the dental educational system in Puebla, México.

ACKNOWLEDGMENT

The authors would like to thank the Benemerita Universidad Autonoma de Puebla and the Consejo Nacional de Ciencia y Tecnología (CONACYT) for providing financial support for PhD. Irene Espinosa during her International Scholarship Award, and for Mauricio Perez during his Master’s studies.

CORRESPONDENCE:

Dr. Irene Aurora Espinosa
Tlacomulco 4513, Col. Ampliación Reforma Sur.
CP 72160 Puebla, Pue. México.
irene.espinosa@correo.buap.mx

REFERENCES

1. Le Resche L, Truelove EL, Dworkin SF. Temporomandibular disorders: a survey dentists’ knowledge and beliefs. *J Am Dent Assoc* 1993; 124:97-106.
2. Greene CS. Managing the care of patients with temporomandibular disorders: a new guideline for care. *J Am Dent Assoc* 2010; 141:1086-1088.
3. De Leeuw R. Orofacial Pain Guidelines for Assessment, Diagnosis and Management. Quintessence Books. 4th ed. Chicago, USA: The American Academy of Orofacial Pain, 2008:131-132.
4. Okeson JP. Management of temporomandibular disorders and occlusion. 5th ed. St Louis: Mosby, 2003:143-189.
5. Le Resche L. Epidemiology of Temporomandibular Disorders: Implications for the Investigation of Etiologic Factors. *Crit Rev Oral Biol Med* 1997; 8:291-305.
6. Isong U, Gansky S, Plesh O. Temporomandibular joint and muscle disorder-type pain in the US adults: the National Health Interview Survey. *J Orofac Pain* 2008; 22:317-322.
7. National Institute of Dental and Craniofacial Research. Facial Pain. 2010. NIH Publication No. 10-3487. URL: <http://www.nidcr.nih.gov/OralHealth/Topics/TMJ/TMJDisorders.htm>
8. Gonzalez YM. Are temporomandibular disorders a public health problem? *Alpha Omegan* 2003;96:11-14
9. Sessle JB, Lavigne JG, Lund JP. Orofacial Pain From Basic Sciences to Clinical Management. 1st ed. Chicago: Quintessence Book, 2001:17-19.
10. Slade GD, Bair E, Kunthel B, Mulkey F, Baraian C, Rothwell R, Reynolds M, Miller V, et al. Study Methods, Recruitment, Sociodemographic Findings, and Demographic Representativeness in the OPPERA Study. *J Pain* 2011; 12:T12–T26.
11. Espinosa SI, Lara MC, Lara CA, Saavedra GM, Vargas GH. Comparación de los aspectos psicosociales (eje II) de los pacientes con trastornos temporomandibulares, de acuerdo a la combinación de diagnósticos físicos (eje I) de los criterios diagnósticos para la investigación de los trastornos temporomandibulares (CDI/TTM). *Rev Oral* 2009;10: 477-481.
12. Slade GD, Diatchenko L, Bhalang K, Sigurdsson A, Fillingim RB, Belfer I, Max MB, Goldman D, et al. Influence of psychological factors on risk of temporomandibular disorders. *J Dent Res* 2007; 86:1120-1125.
13. Klasser GD, Greene CS. Predoctoral teaching of temporomandibular disorders: a survey of U.S. and Canadian dental schools. *J Am Dent Assoc* 2007; 138:231-237.
14. Gontyy AA. Teaching a comprehensive orofacial pain course in the dental curriculum. *J Dent Educ* 1990; 54:319-322.
15. Solberg WK, Friction JR. The role of the dental school in teaching TMD and orofacial pain. *J Craniomandib Disord* 1992; 6:107-110.
16. Greene CS, Stockstill JW, Clark GT. Predoctoral education for TMD and orofacial pain: a philosophical overview. *J Craniomandib Disord* 1992; 6:111-112.
17. Attanasio R, Mohl ND. Suggested curriculum guidelines for the development of predoctoral programs in TMD and orofacial pain. *J Craniomandib Disord* 1992; 6:113-116.
18. Attanasio R, Mohl ND. Suggested curriculum guidelines for the development of continuing education programs in TMD and orofacial pain. *J Craniomandib Disord* 1992; 6:137-140.
19. Attanasio R, Mohl ND. Suggested curriculum guidelines for the development of postdoctoral programs in TMD and orofacial pain. *J Craniomandib Disord* 1992; 6:126-134.
20. Stockstill JW. Curriculum outline for adjunctive predoctoral education in TMD and orofacial pain. *J Craniomandib Disord* 1992; 6:117-122.
21. Friction JR, Pullinger AG, Mohl ND. Postdoctoral education for TMD and orofacial pain. A philosophical overview. *J Craniomandib Disord* 1992; 6:123-125.
22. McNeill C, Falace D, Attanasio R. Continuing education for TMD and orofacial pain: a philosophical overview. *J Craniomandib Disord* 1992; 6:135-136.
23. Mohl ND, Attanasio R. The Third Educational Conference to Develop the Curriculum in Temporomandibular Disorders and Orofacial Pain: introduction. *J Orofac Pain* 2002;16: 173-175.

24. Mohl ND. The Third Educational Conference to Develop the Curriculum in Temporomandibular Disorders and Orofacial pain: Summary/Conclusions. *J Orofac Pain* 2002; 16:198-199.
25. Shankland W. Temporomandibular disorders: standard treatment options. *Gen Dent* 2004; 52:349-355.
26. Klasser GD, Greene CS. The changing field of temporomandibular disorders: what dentists need to know? *J Can Dent Assoc* 2009; 75:49-53.
27. McKinney JF, Mosby EL. Temporomandibular disorders: what to teach in dental school. *J Craniomandib Disord* 1990; 4:17-19.
28. Douglass GD. Making a comprehensive diagnosis in a comprehensive care curriculum. *J Dent Educ* 2002; 66:414-420.
29. Gonzalez Y, Mohl ND. Care of patients with temporomandibular disorders: an educational challenge. *J Orofac Pain* 2002;16:200-206.
30. Alsafi Z, Michelotti A, Ohrbach R, Nilner M, List T. Achieved competences in temporomandibular disorders/ orofacial pain: a comparison between two dental schools in Europe. *Eur J Dent Educ* 2015;19:161-168.
31. Al-Khotani A, Björnsson O, Naimi-Akbar A, Christidis N, Alstergren P. Study on self-assessment regarding knowledge of temporomandibular disorders in children/adolescents by Swedish and Saudi Arabian dentist. *Acta Odontol Scand* 2015; 73:522-529.
32. Alonso AA, Heima M, Lang LA, Teich ST. Dental students' perceived level of competence in orofacial pain. *J Dent Educ* 2014; 78:1379-1387.
33. Glaros AG, Glass EG, McLaughlin L. Knowledge and beliefs of dentists regarding temporomandibular disorders and chronic pain. *J Orofac Pain* 1994; 8:216-222.
34. Baharvand M, Sedaghat Monfared M, Hamian M, Jalali Moghaddam E, Sadat Hosseini F, Alavi KA. Temporomandibular disorders: knowledge, attitude and practice among dentists in Tehran, Iran. *J Dent Res Dent Clin Prospect* 2010; 4:90-94.
35. Just JK, Perry HT, Greene CS. Treating TM disorders: a survey on diagnosis, etiology and management. *J Am Dent Assoc* 1991; 122:55-60.
36. Tegelberg Å, Wenneberg B, List T. General practice dentists' knowledge of temporomandibular disorders in children and adolescents. *Eur J Dent Educ*. 2007; 11:216-221.
37. Patil S, Iyengar AR, Ramneek. Assessment of knowledge, attitude and practices of dental practitioners regarding temporomandibular joint disorders in India. *J Adv Clin Res Insights* 2016;3:64-71.
38. Lee WY, Choi JW, Lee JW. A study of dentists' knowledge and beliefs regarding temporomandibular disorders in Korea. *CRANIO* 2000; 18:142-146.