

Achieved competences in temporomandibular disorders/orofacial pain: a comparison between two dental schools in Europe

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Abstract

Aims: The aim was to study achieved competences in temporomandibular disorders (TMD)/orofacial pain (OP) at two universities by comparing student's knowledge and understanding, satisfaction with their education and confidence in their clinical competences of TMD/OP.

Methods: The study was conducted in collaboration between Malmö University, Sweden—which uses problem-based learning—and the University of Naples Federico II, Italy—which uses traditional educational methods. Final-semester dental students responded to a self-report questionnaire regarding their knowledge and understanding, interpretation of cases histories, clinical experience, satisfaction and confidence in clinical examination, management and treatment evaluation.

Results: No significant difference was found between the students regarding knowledge and understanding. Eighty-seven per cent of the Malmö students and 96% of the Naples students met the criterion on achieved competence. Malmö students had a higher per cent of correct diagnoses than Naples students in the interpretation of case histories. Overall, Malmö students reported most clinical experience and higher confidence than Naples students.

Conclusions: The main findings were that students from Malmö and Naples were, similar in knowledge and understanding of TMD/OP and in satisfaction with their clinical competences. However, Malmö students perceived more confidence in clinical management of patients with TMD/OP. This may reflect that, besides the theoretical part of the programme, a sufficient level of clinical exposure to patients with TMD/OP is essential to gain competences in TMD/OP.

Introduction

Epidemiological studies have found that the prevalence of temporomandibular disorders/orofacial pain (TMD/OP) ranges between 5% and 12% amongst adolescents and adults and often has a potential impact on function, psychosocial well-being and quality of life (1–4). General dental practitioners (GDPs) are typically the first-line professionals to diagnose and manage

patients with TMD/OP conditions and must therefore have the knowledge and skills to manage these patients or, in more complex cases, to know when to refer patients to specialists (5–8). Several abilities—such as clinical skills, knowledge and understanding, interpersonal attributes, problem-solving skills, clinical judgment and technical skills—contribute to clinical competences (9). The Association for Dental Education in Europe has worked to converge and harmonise dental education across Europe. The

document 'Profile and Competences for the European Dentist' describes competences for Temporomandibular Disorders and Orofacial pain (10). To acquire the ability to maintain patients' well-being through health management, students must develop a set of competences, essential for working independently as a general dental practitioner, by the time they obtain they graduate as dentist. The graduates must—with necessary competences and a basic level of attitudes, knowledge and skills—be able to respond to the full range of circumstances encountered in general professional practice (8).

The curriculum at the Faculty of Odontology, Malmö University has a thematic structure and is based on oral conditions prevalent in the community (11). The programme's semesters are structured as themes that reflect these conditions in a context that integrates learning and clinical practice. The sequence of the themes is planned so that students' clinical proficiency gradually improves and the complexity of the learning context increases in a spiral curriculum. The problem-based learning (PBL) curriculum integrates knowledge and clinical training, by exposure to various clinical problems.

Undergraduate dental education in Italy started in 1980 and the University of Naples Federico II was one of the first Italian Universities to establish a dental school. The traditional curriculum allows students to acquire basic knowledge in biology, general medicine, diagnosis and treatment of diseases of the teeth, mouth, jaws, temporomandibular joints and associated tissues as well as prevention and dental rehabilitation. It includes traditional education methods with classes for theory throughout the programme, clinical training with mannequins and participating together with supervisors during the last 3 years and clinical training with patients mainly during the last year.

In many countries, TMD/OP education is part of the dental school curriculum (6, 10, 12–19). The programmes vary considerably between schools (20), as evidenced in surveys which found that dental students had not been offered adequate courses on the diagnosis and management of TMD/OP (6, 20). To bring the problem to the attention of dental schools, professional organisations in the United States and Europe have published recommendations and goals for TMD/OP in the undergraduate curriculum (21, 22).

Few studies have evaluated competences acquired in undergraduate dental education in TMD/OP. Klasser and Greene when comparing courses offered in TMD at United States and Canadian dental schools concluded that lack of standardised, pre-doctoral education of TMD may lead to United States or Canadian patients with TMD/OP being at risk when seeking appropriate primary care for their problems (20). Vallon and Nilner assessed undergraduates' and graduates' perceptions of their education and competences in TMD/OP and found that it increased with increasing level of education (23).

Greenwood et al. (24) surveyed final-year students in various educational programmes to determine students' self-perceived competences and found that, independent of educational format, students' competences grows when theory and practice are integrated.

This study examined TMD/OP competences regarding knowledge and understanding, perceived satisfaction and confidence amongst final-semester students at two dental schools in

two countries in Europe. It was hypothesised that (i) there is no difference in their knowledge and understanding and that (ii) satisfaction and confidence with undergraduate education is higher amongst students, who have followed a curriculum that focuses on practice management and clinical training than amongst students who have followed a curriculum that did not focus on these issues.

Materials and methods

Participants

The study was conducted in Malmö University, Sweden and the University of Naples, Federico II, Italy during 2008 and 2009. At both universities, final-semester dental students were asked to respond to a questionnaire: in Malmö, 32 students (mean age 27 ± 3 years; 47% female) and in Naples, 25 students (mean age 23 ± 3 years; 36% female) answered the questionnaire.

Procedure

Students were informed about the purpose of the study. Naples students responded to the Italian-language version of the questionnaire. Malmö students received the English-language version of the questionnaire. The students answered the questionnaires anonymously. The study followed the guidelines of the Declaration of Helsinki.

Education in TMD and OP

Table 1 presents an overview of the education at the two sites.

Malmö

The PBL curriculum integrates the various oral health subjects, which means that theory is interspersed with clinical practice throughout the 5-years programme by design. One important concept is to allow students to begin accumulating clinical experience early in the programme; theory and practice are disseminated through lectures, seminars and skills laboratories.

TABLE 1. Distribution of education in TMD/OP by semester in the curricula of two dental schools in Europe

Undergraduate programme	Malmö	Naples
Length of programme (years)	5	5
Number of semester	10	10
Lectures/Seminars	3, 6, 7, 8, 9	7, 9, 10
Skills laboratory	3, 6, 7	7
Shadowing supervisor	7	9
Clinical setting with own patient	7, 8, 9, 10 ¹	9, 10 ²
Exam, quiz, evaluation	3, 6, 7, 9, 10	8, 10

¹Undergraduate student responsible for case history, clinical examination, diagnoses and treatment under supervision.

²Undergraduate students participate together with a teacher in assessments and different treatment situations.

Theory is introduced in study groups of 6–8 students, to which problems/cases are distributed once a week. Case histories are presented in a format that students use to define problems, discuss hypotheses and decide what individual knowledge they need to solve the problems. As resources for solving the problem, a reference list of textbooks and scientific articles help structure the learning situation.

Naples

The dental education in Naples 5-year programme following secondary school. TMD/OP is introduced in the fourth year, beginning with theory. In the fifth year, students shadow a clinical instructor once a week for 3 months; they take case histories of patients with TMD/OP and have the opportunity to examine them clinically. Students in small groups also participate in discussions on possible diagnoses and treatment modalities. Students are involved in basic clinical actions such as taking impressions during patient treatment. At the end of the last semester, students have an exam including discussion of case histories.

Questionnaire

The questionnaire covered six areas: knowledge and understanding, case histories, clinical experiences, satisfaction and confidence, literature and attitudes. Before the study began, 10 students in semester eight at Malmö University participated in a pilot study to test whether the questionnaire items and case histories were comprehensible.

Knowledge and understanding

The items were selected from questionnaires previously used to survey dentists' knowledge, experience and attitudes concerning TMD (25–28). Four domains (19 items total) comprised the section:

- Aetiology and epidemiology (six items).
- Diagnostics and classification (four items).
- Treatment and prognosis (five items).
- Chronic pain and pain behaviour (four items).

The items were formulated as statements (Table 2); each statement was accompanied by an 11-point numeric rating scale (NRS) with the end-points 0 representing 'strongly disagree' and 10, 'strongly agree'. For an item requiring a correct response of 'strongly disagree', scores 0–3 were pooled and considered correct, likewise, for an item requiring a correct response of 'strongly agree', scores 7–10 were pooled and considered correct. A consensus group of TMD experts with extensive publication histories had previously assigned the correct response—either 'strongly agree' or 'strongly disagree'—to each statement (25–28). Achieved competences were defined as correct answers to 11 of the 19.

Case histories

Three case histories, representative of patients with TMD, were developed based on common clinical presentations of TMD. The students were asked to set diagnoses more than one diagnosis

TABLE 2. Knowledge and understanding of the aetiology and epidemiology domain and the Diagnostics and classification domain: per cent correct responses at Malmö ($n = 32$) and Naples ($n = 25$)

	Correct answer	Malmö (%)	Naples (%)
Aetiology and epidemiology			
Balancing interferences are commonly related to TMD	Disagree (0–3)	43	68
Orthodontic treatment can prevent the onset of TMD	Disagree (0–3)	36	55
Nocturnal bruxism is caused by occlusal interferences	Disagree (0–3)	87	73
Mouth-opening capacity increases by more than 1 cm between age 12 and 18 years	Disagree (0–3)	24	68
TMD is more common in younger children than in amongst adolescents	Disagree (0–3)	62	82
Stress is a major factor in the development of TMD	Agree (7–10)	87	96
Diagnostic and classification			
Palpatory tenderness of the masticatory system is one of the most common clinical signs of TMD	Agree (7–10)	83	96
An extensive history of previous treatment failures in TMD patients is usually an indication for surgery	Disagree (0–3)	50	77
Measuring mouth opening capacity is reliable assessment method	Agree (7–10)	40	23
TMJ clicking is often caused by internal derangement (disc displacement) in the TMJ	Agree (7–10)	77	91

could be made. Although the instructions did not restrict diagnoses to those from the RDC/TMD taxonomy and non-RDC/TMD diagnoses could be regarded as appropriate and correct, we chose to limit acceptable responses to the RDC/TMD diagnoses as the framework is common at both schools.

- Case I: A 25-year-old woman complains of recurrent headache in the temples that occurs about every second day. She also complains of pain in her jaws, especially when she wakes in the morning. At the clinical examination, you find tenderness on palpation from many masticatory muscles. During the examination, you also once heard clicking during one jaw movement. You observe abrasion facets and tongue impressions.

Correct RDC/TMD diagnosis: myofascial pain

- Case II: A 45-year-old man who previously had jaw clicking is seeking treatment because he has recently been unable to open his mouth wide enough to take big bites. He has never been able to open his mouth wide, but now it is worse. He has pain in the region of his ears when he wakes in the morning. At the clinical examination, maximum opening with and without assistance is 30 mm. When he

opens his mouth, a deviation to the left occurs. Palpation notes tenderness in the left jaw joint, lateral and in various muscles.

Correct RDC/TMD diagnoses: disc displacement without reduction, arthralgia, myofascial pain

- Case III: A man in his fifties is bothered by disturbing noises from his jaw joints when he chews and yawns. At the clinical examination, a distinct clicking, along with grating sounds (crepitus) from the right jaw joint, is audible when he opens and closes his mouth.

Correct RDC/TMD diagnoses: disc displacement with reduction, arthrosis

Clinical experience

Beginning with 'In your undergraduate education, alone or under supervision', five questions were asked (Table 5).

Perceived satisfaction and confidence

This section contained two items: 'How satisfied are you with your undergraduate education in TMD and Orofacial pain?' and 'How confident are you concerning your competences in the management of TMD/Orofacial pain?' followed by questions in three domains:

- Clinical examination (four questions).
- Management (six questions).
- Evaluation (two questions).

Satisfaction and confidence for each question were judged on an 11-point NRS with the end definitions 'not satisfied' and 'very satisfied', or 'no confidence' and 'very high confidence'.

Literature

The item 'From what kind of literature did you acquire your competences in TMD?' had these possible responses: compendium, textbooks, hand-outs, scientific articles and handwritten notes from colleagues.

Attitude towards patients with TMD

Students were asked to complete the statement 'To treat TMD patient with pain is...' by choosing two of 10 possible adjectives. Five of the adjectives were positive (interesting, rewarding, educational, worthwhile, challenging) and five were negative (stressful, difficult, frustrating, unpleasant, demanding). The attitude of the students was judged to be positive if both adjectives were positive, neutral if one was positive and one negative and negative if both were negative. The scale was previously used to measure attitudes towards pain and its treatment amongst medical students (29, 30).

Statistical analyses

Independent samples *t*-test tested the significance of differences amongst groups when the variable was measured on an interval scale.

When the response type was categorical or dichotomous, the raw data were reduced to frequencies and chi-square test

determined the significance of differences amongst independent groups. When the expected frequency in any individual cell was < 5, Fisher's exact test was used for 2 × 2 tables. Statistical tests were two-tailed and the significance level was set at 5%.

Pearson's correlation coefficient (*r*) analysed the relationship between clinical experiences measured in number of treated patients and self-report of satisfaction and confidence in managing patients.

Results

Questionnaire response rates were 94% at Malmö and 88% at Naples.

Tables 2 and 3 present the distribution of correct answers in the knowledge and understanding section. No significant differences between students from Malmö and Naples were found: 87% of the Malmö students and 96% of the Naples students met the criterion on achieved competence, which verified our hypothesis.

Table 4 presents the RDC/TMD-based diagnoses of the three case histories. Significant difference ($P < 001$) was found

TABLE 3. Distribution of knowledge and understanding in the treatment and prognosis domain and in the chronic pain and pain behaviour domain: per cent correct responses at Malmö ($n = 32$) and Naples ($n = 25$)

	Correct answer	Malmö (%)	Naples (%)
Treatment and prognosis			
Occlusal adjustment is a useful early treatment for TMD	Disagree (0–3)	80	91
Biofeedback can be useful in the treatment of TMD	Agree (7–10)	97	86
Relaxation treatment is not an effective treatment for patients with TMD	Disagree (0–3)	93	86
Antidepressants are never indicated in the management of TMD	Disagree (0–3)	67	82
The occlusal appliance eliminates bruxism	Disagree (0–3)	83	41
Chronic pain and pain behaviour			
Difficulty in sleeping is a common finding in chronic pain	Agree (7–10)	80	64
Depressed mood is fairly common in chronic TMD patients	Agree (7–10)	97	86
The mechanisms of acute and chronic pain are the same	Disagree (0–3)	77	91
Although some patients with TMD have psychological problem, these problems are usually unrelated to their pain	Disagree (0–3)	77	86

TABLE 4. Distribution of RDC-ITMD-based diagnosis of three case histories: per cent correct responses at Malmö ($n = 32$) and Naples ($n = 25$)

	Malmö (%)	Naples (%)	<i>P</i>
Case I			
Myofascial pain	97	40	0.001
Case II			
Disc displacement without reduction	91	100	NS
Arthralgia	60	0	0.000
Myofascial pain	43	0	0.000
Case III			
Disc displacement without reduction	50	59	NS
Arthrosis	87	69	NS

TABLE 5. Students' clinical experience in two dental schools presented as number of patients (mean and SD)

	Malmö Mean ± SD	Naples Mean ± SD	<i>P</i>
Patients/treatments provided			
Patients with TMD/OP examined and treated?	9.2 ± 4.4 ¹	6.9 ± 7.9 ²	NS
Patients treated with occlusal appliances?	4.4 ± 2.7	2.0 ± 3.5	0.01
Patients treated with information?	8.5 ± 3.6	6.4 ± 7.9	NS
Patients treated with behaviour management?	2.3 ± 4.1	4.1 ± 5.7	NS
Patients referred to another setting?	0.2 ± 0.5	0.7 ± 1.5	NS

¹Undergraduate student responsible for case history, clinical examination, diagnoses and treatment under supervision.

²Undergraduate students participate together with a teacher in assessments and different treatment situations.

between the students-groups in pain related TMD diagnosis such as myofascial pain and arthralgia. Table 5 summarises the students' answers on clinical experiences. Responses to question about number of patients treated with occlusal appliances differed significantly between the universities. A difference between the students in Malmö and Naples was that undergraduate students in Malmö were responsible for case history, clinical examination, diagnoses and treatment under supervision, whereas students from Naples participated together with a teacher in the assessment and treatment situations.

Figure 1 illustrates students' perceived satisfaction with education and confidence in examining and managing patients with TMD/OP defined as ≥ 6 in the total score. Perceived satisfaction was the same in Malmö (73%) compared with Naples (68%), whilst confidence was significantly higher in Malmö (70%) compared with Naples (27%) ($P = 0.002$). Our hypothesis was verified for confidence but not for satisfaction.

Based on the following, students acquired knowledge varied between the schools: textbooks, (Malmö 100%, Naples 86%); scientific articles (Malmö 80%, Naples 50%); handouts (Malmö

73%, Naples 23%); compendium (Malmö 63%, Naples 23%); and handwritten notes (Malmö 20%, Naples 45%).

Table 6 presents attitude towards treating TMD patients with pain. A majority of students reported a neutral or positive attitude towards treatment, and no significant difference was found between Malmö and Naples.

Clinical experience in number of patients treated with occlusal appliances was modestly correlated with satisfaction ($r = 0.48$, $P < 0.000$) and confidence ($r = 0.41$, $P < 0.000$). Number of patients treated with behavioural management was also modestly correlated with satisfaction ($r = 0.40$, $P < 0.000$) and confidence ($r = 0.42$, $P < 0.000$).

Discussion

Comparisons between undergraduate education in dental schools provide possibilities for harmonising the dental curriculum throughout Europe (8, 24, 31, 32). The European network for the evaluation of dental education has suggested that there is a need to promote higher standards and quality assurance (33). The EU Directive 2005/36/EC encouraged convergence in undergraduate dental education through mutual recognition of qualifications and free movement of dentists across the EU (34). The present study was carried out to share, exchange and debate different educational approaches. The list of competences required in orofacial pain at both schools followed in general the guidelines for undergraduate education in orofacial pain recommended by the European Academy for Temporomandibular Disorders (22). A publication from Malmö University specifies the competences in more detail (23).

The main findings of this study were that the students in Malmö and Naples possessed, in general, similar knowledge and understanding of TMD/OP but were not similar in their diagnoses of case histories. This may reflect that what is essential to gaining competences in TMD/OP is not only the framework of the educational programme but also a sufficient level of clinical exposure to patients with TMD/OP (11, 35). The shorter the time between learning and application, the better the performance (11). Varying situations with contextual learning and reflection on action are important in education (36). It has also been shown that repeated practice of clinical procedures only does not create a sufficient learning curve (37). In case of dental students in TMD/OP, it means that a shift from single procedures or lectures to be fully responsible for all clinical procedures and management of patients with TMD/OP in a clinical context.

Reported confidence was higher overall amongst in Malmö students. Exposure to clinical examination and treatment of patients with TMD/OP is probably one explanation. In the clinical context, setting service requirements and patient treatment needs have a significant impact on the range of learning experience available to students. In addition, PBL focuses on clinical problem solving and exposes students to real-life situations that demand integration of knowledge and understanding of different disciplines and subject areas (11). Concerning the assessment of clinical competences, Miller (35) stressed the importance of exposure to clinical interactions with patients in order to enhance the learning outcome. Not only knowledge is important for competences but—even more—performance and

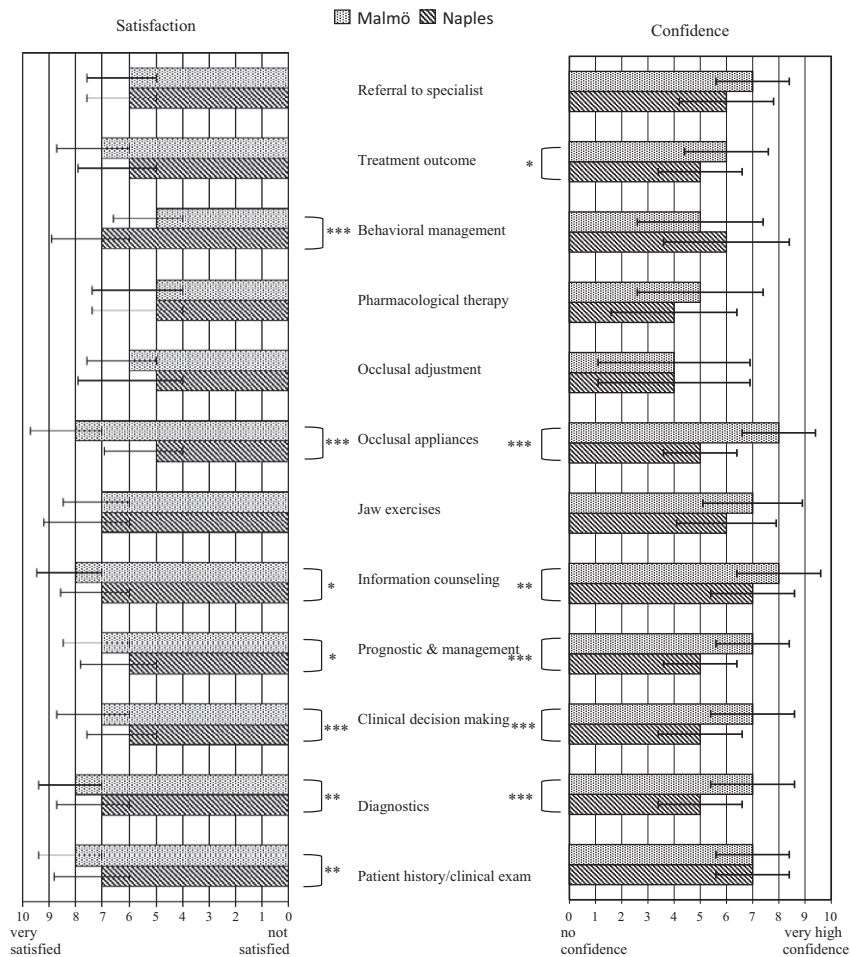


Fig 1. Perception of confidence and satisfaction in clinical decision-making, prognostics, treatments and referrals of patients with TMD/OP in two schools: mean, SD and P-values. Brackets denote comparisons significantly different at * $P < 0.05$, ** $P < 0.001$, *** $P < 0.001$.

TABLE 6. Students' attitude towards treating patients with TMD in Malmö (n = 32) and Naples (n = 25)

Attitude	Malmö (%)	Naples (%)	P
Positive	47	36	NS
Neutral	43	64	NS
Negative	10	0	NS

the action, such as knowing how to use acquired knowledge in clinical situations.

A general observation is that the level of knowledge was similar between the two universities. A comparison of the findings from this study with those reported in the other studies using similar questions confirms that now students report a level of knowledge that is more consistent with the knowledge held by specialists compared with the GDPs (26–28, 38).

In the diagnoses of the three case histories, students in Malmö were more precise in the diagnosis. Possible explanations for this are (i) that students in Malmö are used to solving written case histories as this is fundamental to PBL and (ii)

that students in Malmö had been more exposed to clinical cases. In teaching, the use of case histories based on undiagnosed patients from the clinic tends to activate the learning situation (11). The focus of evidence-based medicine becomes important in a patient-centred clinical situation. Despite the possible problems in method as well as setting, we regard case histories as an alternative, interesting approach for gaining insight into how students synthesise their knowledge.

There was a difference between the sites in exposure to patients with TMD/OP. Students in Malmö reported more confidently than students in Naples. An interesting finding was the strong association between students' clinical exposure to patients and reported confidence in TMD/OP education.

In Malmö, students—who had treated the highest number of patients with information and occlusal appliances compared with Naples—reported the highest satisfaction and confidence for those two therapies. Likewise, Naples students—who had treated the highest number of patients with behavioural therapy compared with Malmö—reported the highest satisfaction and confidence for that therapy.

There were no significant differences in student's attitude at the two sites in treating patients with TMD/OP, indicating that

their attitude towards taking care of patients with TMD/OP is generally neutral to positive. Despite limitations in resources, which have an impact on curricula, both schools managed to instil a sufficiently positive attitude in their students with respect to the understanding and caring of patients with a potentially complex pain disorder.

This study has limitations. The results were based on a small number of students, particularly for Naples. The reliability of the statements is unknown, but a consensus amongst specialists on the correct responses has been reported (26). Other studies have pointed out that agreement amongst specialists in orofacial pain varies for the statements (26). We can also not be certain that the results truly reflect students' knowledge: although one of the schools answered the questionnaire in their mother tongue, the second did not.

One particular strength of the study which is worth highlighting is that a Swedish dental student wanted to study different educational programmes in dental schools using the same biopsychosocial model for assessing TMD, the RDC/TMD (39). The study questionnaire assessed a broad spectrum of student's competences in knowledge, clinical experience, attitude, satisfaction and confidence, all of which are core aspects of a successful biopsychosocial approach to diagnosis and treatment. Statements on knowledge and understanding amongst practising dentists were taken from other studies and were found to be applicable to undergraduate dental students in a pilot study (25, 26). This questionnaire could be potentially useful as a method to gain insight into the relative strength and weaknesses in a curriculum in TMD/OP at a dental school.

In conclusion, this study found that the framework of the educational programme was not the only essential factor in gaining competences in knowledge, the amount of exposure that the students had to patients suffering from TMD/OP was also critical. It was also found that to gain competences in TMD/OP, it is important that the student be exposed not only to theoretical but also to clinical practice.

Conflict of interest

The authors declare no competing interests.

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