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Original Article

Academic knowledge on TMD assessed using DC/TMD: a cross-sectional study

Conhecimento acadêmico em DTM avaliado o uso do DC/TMD: estudo transversal

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Resumo

Introdução: O conhecimento aprofundado sobre disfunção temporomandibular (DTM) e dor orofacial (DOF) é fundamental para acadêmicos de odontologia e profissionais da saúde. **Objetivo:** Este estudo tem por objetivo avaliar o conhecimento sobre disfunção temporomandibular (DTM) e dor orofacial entre estudantes de Odontologia de diferentes universidades públicas e privadas, destacando a necessidade de uma abordagem interdisciplinar, baseada em evidências para o diagnóstico e tratamento dessas condições. **Material e método:** Foi realizado um estudo transversal com uma amostra por conveniência de estudantes de Odontologia, que responderam a três conjuntos de perguntas. Um total de 213 estudantes participaram do questionário, sendo 70 homens e 143 mulheres, com idade média de 24 anos. **Resultado:** As respostas dos conjuntos 2 e 3 indicaram que 67,7% dos estudantes têm dificuldade em diagnosticar a disfunção temporomandibular, enquanto 84,6% se sentem inseguros para propor o tratamento, embora aproximadamente 95% tenham demonstrado conhecimento teórico sobre a DTM no conjunto 1. **Conclusão:** Os estudantes apresentaram baixa concordância com conceitos fundamentais sobre a disfunção temporomandibular, uma ênfase excessiva em fatores oclusais e pouca confiança em sua capacidade de oferecer um atendimento adequado. A principal deficiência identificada foi a falta de prática clínica.

Descritores: Disfunção temporomandibular; diagnóstico; avaliação qualitativa; ensino superior.

Abstract

Introduction: In-depth knowledge of temporomandibular dysfunction (TMD) and orofacial pain (OFP) is fundamental for dental students and healthcare professionals. **Objective:** To assess the knowledge about temporomandibular Disorder (TMD) and orofacial pain among dental students from different public and private universities, highlighting the need for an interdisciplinary and evidence-based approach for the diagnosis and treatment of these conditions. **Material and method:** A cross-sectional study was conducted with a convenience sample of dental students, who responded to three sets of questions. A total of 213 students participated in the questionnaire, consisting of 70 men and 143 women, with an average age of 24 years. **Result:** The responses from sets 2 and 3 indicated that 67.7% of students have difficulty diagnosing temporomandibular disorder and 84.6% feel insecure about proposing treatment, while approximately 95% demonstrated knowledge about temporomandibular disfunction in set 1. **Conclusion:** The students showed low agreement with the fundamental concepts of temporomandibular disorder, an overemphasis on occlusal factors, and a confidenceless in their ability to provide adequate care. The main deficiency identified was the lack of clinical practice.

Descriptors: Temporomandibular disorder; diagnosis; evaluation qualitative; higher education.

INTRODUCTION

Orofacial pain (OFP) is an unpleasant sensation affecting the hard and soft tissues of the face, head, and neck. It causes sensory and emotional discomfort due to actual or potential tissue damage and harms patients' quality of life[1]. Odontogenic pain originates in dental tissues such as the pulp or periodontium, and it is usually the most common pain in patients seeking OFP treatment[2]. Pain diagnosis and treatment are essential skills that dentists must acquire during their education[1,3].

Temporomandibular disorders (TMDs) involve changes in masticatory muscles, temporomandibular joints, or both. The most common symptoms include joint sounds such as clicking or crepitus, preauricular and masticatory muscle pain, and restrictions or deviations during mandibular opening movements. It is a multifactorial condition mainly associated with five etiological factors: trauma, intense pain stimuli, parafunctional activities, and psychological factors such as stress, anxiety, and depression[4-6].

TMD prevalence widely varies in the literature depending on the studied population (general or specific patients) and applied diagnostic methods[7,8]. The estimated prevalence in adults is around 10-15%, and it varies around 4-7% in adolescents[7-10]. These conditions affect more women than men, with a 2:1 ratio in population studies and approximately 3:1 to 9:1 among specific samples[8,11]. Considering the economic and quality of life impacts associated with diagnosing and treating TMD and other OFP conditions, dentists are usually expected to develop skills to prevent, detect, and manage these disorders during their education[12,13]. That highlights the relevance of this ability as a primary skill for all dentists and not only OFP and TMD specialists.

Questionnaire-based studies conducted in several countries have analyzed dentists' knowledge and attitudes regarding TMD, showing significant disparities in the perspectives and care provided by general dentists and TMD specialists, with physiopathological aspects being the most conflicting[14,15]. A study conducted with a German population showed that 30% of dental students attending the last course semester had no confidence regarding non-dental OFP diagnosis and treatment, and 48% had only a minimum confidence level. As for dental students in clinical semesters, 98% expressed needing further education on diagnosing and treating OFP patients[16]. Considering the significant interference of such pain and dysfunction with quality of life, improving dentists' ability to diagnose and treat TMD will require adequate care provision to patients in private and public health sectors[17].

The prevalence and complexity of TMD and OFP require in-depth knowledge of these conditions from dental students and health professionals[16,17]. The temporomandibular joint (TMJ) is a vital structure for essential functions such as chewing, speaking, and swallowing, and its dysfunction may cause various disabling symptoms. Therefore, understanding these conditions' anatomical, physiological, and etiological foundations is crucial for effective clinical practice and patient well-being[18,19].

The relevance of interdisciplinary knowledge of TMD and OFP management shows that a collaborative approach between dentists, physiotherapists, and psychologists yields better outcomes for these conditions, highlighting the need for an integrated view of patient care. Moreover, epidemiological studies emphasize the high prevalence of TMD and OFP in the population, reinforcing the relevance of academic and continuous training of health professionals in this field[20].

Understanding the neurobiological foundations of OFP is essential to develop effective therapeutic strategies. Knowing central and peripheral mechanisms involved in the genesis of pain provides valuable insights into developing novel therapeutic approaches[21].

Therefore, is TMD and OFP knowledge of dental students from different public and private universities sufficient to provide evidence-based diagnoses and treatments to patients?

MATERIAL AND METHOD

Study Design

This cross-sectional study included a convenience sample of dental students regularly enrolled in public or private higher education institutions in the Triângulo Mineiro region in Minas Gerais, Brazil. Qualitative methods comprised and quantified the relevant objective criteria comprehensively. All institutions with participating students are accredited and registered with the Brazilian Ministry of Education (MEC), according to its website[22]. The Research Ethics Committee approved this study (CAAE #72947923.0.0000.5565).

The participants answered an online questionnaire via Google Forms. Only those who read and agreed to the consent form, which included the research objectives, risks, and benefits, would have their responses collected.

Assessment of the Knowledge, Skill, Diagnosis, and Certainty Regarding TMD Treatment

The sample comprises undergraduate dental students who met basic requirements to participate in the research: (1) being regularly enrolled in a higher education institution; (2) having attended a TMD, occlusion, or similar course. The questionnaire included 25 objective questions with answers limited to (1) yes, (2) no, and (3) I do not know, and it was adapted to this study according to previous research[23].

The questionnaire was divided into three sections. The first section assessed TMD knowledge level, including diagnosis, etiology, and treatment. The answers were recorded as relative and absolute frequencies, noting their disparities and comparing them with the studies' gold standard.

The second section evaluated the confidence level of participants in diagnosing and proposing treatments for TMDs according to their knowledge. The answers were recorded and compared with those in the first section, seeking correlations between the knowledge and confidence regarding diagnoses and treatments.

The third section verified the knowledge of the TMD diagnosis questionnaire - the Diagnostic Criteria for Temporomandibular Disorder (DCTMD) - used internationally for academic and clinical purposes. The findings were recorded to seek an overall correlation to both previous sections.

Statistical Analysis

The study used R Core Team software by R Foundation for Statistical Computing (2021), version 4.1.2, to organize and analyze the data, presenting them descriptively with data distribution and frequency.

RESULT

The response rate of the study was high, as all 213 students (100%) agreed to participate. There were 70 men (32.8%) and 143 women (67.2%) aged from 19 to 43 years (mean age = 24.15).

Table 1 presents students' level of agreement with the statements considered the gold standard for TMD etiology, diagnosis, and treatment. Overall, the answers indicated a medium agreement level with the declarations. The most significant disagreements occurred in statements 2, 3, 7, 10, 13, and 17, while the other questions had more than 50% agreement.

Table 1. Questions related to the etiology, diagnosis, and treatment of temporomandibular disorders (TMD)

Questions	Answer according to the standard		
	Standard Answer	N	(%)
1. Is occlusal adjustment the definitive treatment for TMDs?	**No**	117	54.9
2. Is orthodontic treatment one of the treatments for TMDs?	**No**	32	15.02
3. Is occlusal adjustment one of the least invasive ways to manage TMDs?	**Yes**	96	45.07
4. Can any patient with some type of facial pain be considered to have TMD?	**No**	127	59.62
5. Is every headache a clinical sign of TMD?	**No**	127	59.62
6. Are TMDs divided into 2 major groups: muscular or articular?	**Yes**	112	52.58
7. Should the imaging diagnosis of TMDs be performed using panoramic x-rays?	**No**	102	47.88
8. Are joint TMDs diagnosed with the aid of magnetic resonance imaging?	**Yes**	107	50.23
9. Is the use of muscle-relaxing interocclusal splints a treatment modality for TMDs?	**Yes**	124	58.21
10. Is the use of botulinum toxin a treatment for TMDs?	**No**	42	19.71
11. Do TMDs comprise a group of multidisciplinary dysfunctions requiring support from various health specialties?	**Yes**	120	56.33
12. Is physiotherapy a conservative form of treatment for TMDs?	**Yes**	118	55,39
13. Are changes in sleep patterns one of the factors that can trigger TMD?	**Yes**	101	47.41
14. Does stress make the patient more susceptible to TMD?	**Yes**	107	50.23
15. Should non-invasive and reversible therapies be the first choice of treatment for patients with TMD? Are thermotherapy and muscle stretching examples of these conservative treatments?	**Yes**	111	52.11
16. Is bruxism treated only with the use of muscle-relaxing interocclusal splints?	**No**	127	59.62
17. Will the management of orofacial pain always be initially performed with basic pharmacology?	**No**	90	42.25
18. Can orofacial pain be related to psychological disorders?	**Yes**	124	58.21
19. Can the somatization of psychological disorders culminate in TMD?	**Yes**	130	61.03

Regarding the confidence and certainty to propose TMD diagnosis and treatment (Table 2), the answers to questions 1 and 2 differed from questions 3 and 4. Respectively, 98.5% and 94.4% of answers to questions 1 and 2 showed that students know TMD terminology and acknowledge it as a dental specialty in Brazil. Diametrically opposed, 67.7% of students have difficulties in identifying and diagnosing TMD (Question 3), and 84.6% feel insecure (Question 4) in proposing conducts for TMD management and treatment.

The assessment of the knowledge and applicability of the DC/TMD questionnaire in Table 3, with the familiarity of students with this criterion, shows a gap. More than 50% of participants know the need for systematized and valid diagnostic criteria for TMDs, but only 35.21% know about the DC/TMD as an internationally validated diagnostic questionnaire and method.

Table 2. Confidence level in issuing diagnosis and proposing treatment for temporomandibular disorders

Questions	Answer Frequency	
1. Do you know the terminology Temporomandibular Disorder and Orofacial Pain (TMD)?	**Yes**	210 (98.5%)
	No	3 (1.4%)
2. Did you know that Temporomandibular Disorder and Orofacial Pain, besides being a disorder of the stomatognathic apparatus, is also a dental specialty recognized by the Federal Council of Dentistry?	**Yes**	201 (94.4%)
	No	12 (5.6%)
3. Can you identify patients with temporomandibular disorder?	**Yes**	69 (32.3%)
	No	144 (67.7%)
4. Do you feel confident in diagnosing and treating temporomandibular disorders?	**Yes**	33 (15.4%)
	No	180 (84.6%)

Table 3. Knowledge of the diagnostic criteria for temporomandibular disorders (DC/TMD) and its applicabilities

Questions	Answer according to the standard		
	Standard Answer	**N**	**(%)**
1. Does the diagnosis of temporomandibular disorders and orofacial pain rely on scientific criteria for execution?	**No**	123	57.74
2. Does the diagnosis of TMDs require a scientifically validated questionnaire following a methodological sequence that culminates in the final report?	**Yes**	107	50.23
3. Is the Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) an internationally validated questionnaire used for TMD diagnoses?	**Yes**	75	35.21

DISCUSSION

The knowledge acquired in public and private universities is insufficient for clinical practice excellence, corroborating this study's hypothesis. Analyzing the current knowledge and attitudes regarding temporomandibular disorder (TMD) management among these students may provide valuable insights into their actual understanding of TMDs and elucidate the application of the Diagnostic Criteria for Temporomandibular Disorder (DC/TMD) questionnaire to identify and propose treatment for this condition. The only study with dental students concluded that their knowledge throughout education was insufficient to propose an acceptable TMD diagnosis[14]. General dentists and specialists showed very little knowledge about the physiology of occlusion and temporomandibular joint (TMJ) and the diagnosis and management of their disorders[18,20].

This study demonstrated that students highly disagreed with the current gold standard concepts of TMD, and the most significant disagreements occurred in questions 2, 3, 7, 10, 13, and 17. Assessing the core of questions that received less than 50% agreement showed that all inquiries presented TMD treatment proposals, either conventional or modern.

Items 2 and 3 seek to correlate orthodontic treatment and occlusal adjustment as TMD management strategies. Approximately 84.9% of students agreed with orthodontic treatment as an alternative TMD treatment, and 54.93% also accepted occlusal adjustment as a TMD treatment. These findings emerge because several Brazilian universities still teach TMD and orofacial pain (OFP) in the occlusion course[21]. Almost 55% of students identified occlusal adjustment as a TMD treatment because of the primary correlation of TMDs to occlusal interferences as the prevailing factor. Abbreviating TMDs to plain occlusal factors demonstrates a limitation of knowledge and diagnosis. The literature shows that simple occlusal adjustments in patients with parafunctional habits when awake and symptomatological occlusal interferences

will momentarily improve symptoms, promoting a false impression of relief. However, the pain will be back when the parafunctional habit returns. Hence, psychological factors are also relevant for TMD diagnosis[23].

Item 10 presents a correlation between botulinum toxin and TMD treatment. In this item, 80.2% of participants believe that botulinum toxin is a treatment choice for TMD. However, a review including 18 articles correlating botulinum toxin to TMD treatment agreed on the satisfactory outcomes of this toxin in managing OFP and TMD but as a complement to other established strategies[24]. Another study assessing bruxism treatment with botulinum toxin defined bruxism as a muscle hyperactivity mechanism mediated by the central nervous system; therefore, the toxin will have a peripheral action, promoting an initially local analgesic function without providing a definitive solution[24,25].

Items 13 and 17 demonstrate correlations to the relevance of sleep and pharmacotherapy in managing TMDs. In these questions, 47.41% and 42.25% of students agreed with the optimal response, classifying sleep as crucial to reducing or treating TMDs and medications as a complementary treatment. Several studies demonstrate a direct relationship between poor sleep quality and TMD manifestation. Among the most prevalent factors is the psychosocial association of patients with painful TMDs and poor sleep quality, forming a vicious circle[8,17,24]. Poor sleep quality associated with pain decreases the quality of life, directly influencing overall and mental health and the development of work functions, requiring a multi-professional intervention combined with a correct diagnosis[26].

The questions involving a multidisciplinary approach of TMD patients evaluate student knowledge about the work of psychologists and physiotherapists in managing and assisting TMD diagnosis and treatment. Hence, questions 18 and 19 received more than 50% agreement with the standard answer, demonstrating multi-professional knowledge from students. The literature presents relevant psychological alterations in patients diagnosed with chronic or acute TMD, including depression, anxiety, and high stress levels[27,28].

The second part of the questionnaire asked the students about confidence in proposing conducts for TMD, showing dichotomous situations. Approximately 95% of answers were positive for dysfunction knowledge and Council validation as a specialty. However, 67% of participants cannot identify TMDs, and almost 85% do not feel confident in proposing treatment conducts. The American Dental Education Association (ADEA) recommends that dental undergraduates studying TMDs learn to "prevent, diagnose, and manage these alterations" during their education[23]. ADEA also suggests inserting active PBL (problem-based learning) and CBL (case-based learning) methodologies associated with an integrated and multidisciplinary teaching model, instructing students about patient complexity[24]. These education improvements directly influence the formation of future dentists because these students acquire a higher level of experience and confidence in treating TMD patients[18,21]. A convergence point in this study is the low confidence in proposing treatment to TMD patients and the high correlation of occlusal adjustment as a treatment option. An Indian study in public and private universities indicated that 58.1% of last-year dental undergraduates confirmed that occlusal adjustment is a TMD treatment option[25]. This correlation persists in dental academic training due to the mixture of occlusion and TMD courses. Hence, separating these topics into different subjects and extending the clinical experience is required, as emphasized by other studies[27].

Academic and clinical environments apply the existent methodological criteria to detect TMDs correctly[25]. The DC/TMD is the main internationally validated questionnaire for diagnosing and proposing conducts for TMDs in academic and clinical settings[26]. The assessment of the third axis of the questions in this study regarding the TMD diagnostic tool (DC/TMD) showed that only 35.71% of students know its function and management.

A study using the DC/TMD presented an accuracy index of joint and muscle TMD and pain of 80%, 85%, and 86%, respectively[24]. The low use of this tool, combined with students' answers in this study, is attributed to the need for previous training and familiarity with its application,

followed by the correct understanding of TMD etiology and diagnosis. Another factor potentially associated with such low application is the need for a multi-professional approach, which remains scarce within the academic environment. A study with undergraduate dental students in the USA and Japan used an alternative questionnaire based on the DC/TMD, comparing the time for execution and correct diagnosis. It presented 75% of correct diagnoses from the alternative tool, with a 27% shorter execution time than the DC/TMD, in which participants had 66% accurate diagnoses and a 10% longer questionnaire application time than the alternative tool[28].

CONCLUSION

Students showed low agreement with essential TMD concepts, overvaluation of occlusal factors, and a lack of confidence in their ability to provide adequate care to patients with this disorder. The main deficiency was the lack of clinical practice. Considering the limitations of this study, the findings suggest the need to reformulate the dentistry curriculum, separate TMD and occlusion contents, and create or improve the mandatory clinical component.

AUTHORS' CONTRIBUTIONS

Paulo Cézar SIMAMOTO JÚNIOR: Conceptualization, Curation, Formal Analysis, Project administration, Resources, Supervision, Writing – original draft, Writing – review & editing. Eduvaldo Campos SOARES JÚNIOR: Conceptualization, Investigation, Methodology, Writing – original draft, Writing – review & editing. Nicole Anália Borges ROCHA: Curation, Investigation, Methodology, Writing – original draft. Débora Rosa MEDEIROS: Curation, Investigation. Marcelo Zanchetta DO NASCIMENTO: Formal Analysis, Project administration, Writing – review & editing.

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CONFLICTS OF INTERESTS

The authors declare no conflicts of interest.

DATA AVAILABILITY

The contents underlying the research text are contained in the manuscript.

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