# Comparison of instruments used to select and classify patients with temporomandibular disorder

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***ABSTRACT***

*The aim of the present study was to identify the relationship among instruments used to screen and diagnose temporomandibular disorders (TMD). A retrospective study was conducted using medical records of patients with temporomandibular disorder who had visited the institution for initial assessment between January and December 2015. Medical history and physical examination data were collected, particularly those focusing on the diagnosis of TMD and TMJ (temporomandibular joint) function. The following instruments were used to assess the severity of the TMD signs and symptoms: the Fonseca Anamnestic index (FAI), the Helkimo index (HI), the American Association of Orofacial Pain Questionnaire (AAOPQ) and the Jaw Symptom & Oral Habit Questionnaire (JSOHQ). Thirty-eight patient records were included, with prevalence of women (84.6%) and mean age 37.42 ± 14.32 years. The patients who were classified as having severe TMD by the FAI exhibited more positive responses on the AAOPQ (6.25 ±1.42; one-way ANOVA F=15.82), with a statistically significant difference when compared to patients with mild TMD (3.0 ±1.22; p<0.01). A positive correlation (r=0.78; p<0.01) was found between the number of positive responses on the AAOPQ and the sum of the JSOHQ scores. Patients who were classified with severe TMD on the FAI exhibited higher scores on the JSOHO (18.58 ±4.96/ one-way ANOVA F=14.43), with a statistically significant difference when compared to patients with moderate (12.08 ±5.64; p<0.01) and mild TMD (7.46 ±4.89; p<0.01). Conclusion: In the study sample, there was consistency among the instruments used to differentiate patients with severe and mild TMD. The selection of instruments should be rational, in order to improve the quality of the results.*

***Key words:*** *Temporomandibular joint disorders, signs and symptoms, surveys and questionnaires, facial pain.*

## Avaliação de instrumentos utilizados para selecionar pacientes com disfunção temporomandibular

***RESUMO***

*O objetivo deste estudo foi identificar a relação entre os instrumentos utilizados para selecionar e diagnosticar os pacientes com disfunção temporomandibular (DTM). Foi realizado um estudo retrospectivo utilizando prontuários odontológicos de pacientes atendidos devido a dor e disfunção na articulação temporomandibular, que haviam procurado a instituição para uma avaliação inicial entre janeiro e dezembro de 2015. Foram coletados dados da história médica e do exame físico, particularmente aqueles que se concentraram no diagnóstico de DTM. Os seguintes instrumentos foram utilizados para avaliar a gravidade dos sinais e sintomas da DTM: o índice anamnésico de Fonseca (FAI); O índice Helkimo (HI); o questionário da Associação Americana de Dor Orofacial (AAOPQ) eo Questionário de Sintomas e Hábitos Orais (JSOHQ). Foram incluídos trinta e oito prontuários de pacientes, com prevalência de mulheres (84,6%) e idade média de 37,42 ± 14,32 anos. Os pacientes que foram classificados com DTM severa pela FAI apresentaram maior número de respostas positivas no AAOPQ (6,25 ± 1,42; ANOVA F = 15,82), com diferença estatisticamente significativa em comparação com pacientes com DTM leve (3,0 ± 1,22; p < 0,01). Foi encontrada uma correlação positiva (r = 0,78; p <0,01) entre o número de respostas positivas no AAOPQ e a soma dos escores no JSOHQ. Os pacientes que foram classificados com DTM severa na FAI exibiram pontuações mais altas no JSOHO (18,58 ± 4,96 / ANOVA F = 14,43), com diferença estatisticamente significativa quando comparados a pacientes com DTM média (12,08 ± 5,64; p <0,01) e leve (7,46 ± 4,89; p <0,01). Na amostra estudada, houve congruência entre os instrumentos utilizados para diferenciar os pacientes com DTM grave e leve. A seleção de instrumentos deve ser racional, a fim de melhorar a qualidade dos resultados.*

***Palavras chave:*** *disfunção temporomandibular, sinais e sintomas, inquéritos e questionários, dor facial.*

## INTRODUCTION

Temporomandibular disorders (TMDs) is a collective term that defines a subgroup of painful orofacial disorders involving pain in the temporomandibular joint (TMJ), fatigue of the craniofacial and cervical muscles and limited mandibular movements.[1] Muscle-related conditions account for the largest subgroup.[2]

A number of assessment tools have been proposed for use in clinical practice and research on individuals with TMD, including the American Academy of Orofacial Pain questionnaire (AAOPQ), the Helkimo Index (HI), the Fonseca anamnestic index (FAI), and the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD), which can be used with clinical assessments, radiography, Magnetic Resonance Imaging, Computed Tomography and electromyography.[3,4]

An effective scale must identify patients correctly and discriminate normal subjects. Helkimo constructed an index by adding up the presence of symptoms and assigning a degree of severity when a certain level was exceeded. This index seems to provide a satisfactory indication of the severity of TMD. Helkimo also introduced a fixed set of symptoms, with well-defined assignments in the segments of the index and computation of the index-class, there by enabling the comparison of results. [5]

The severity of TMD is often analyzed. The Fonseca anamnestic index (FAI) has been widely employed for such purpose in clinical and epidemiological studies.[1,3,4,6] However, Chaves et al.[4] suggested that the FAI has not yet been completely validated and does not providea diagnostic classification of TMD. The data obtained using the FAI are therefore restricted to the classification of the severity of TMD signs and symptoms.

A number of authors have used two or more instruments to determine the level of agreement between them and with clinical findings.[7,8,4] It is essential to select a reliable instrument to assess TMD. Only scales that provide reliable reflections of the underlying problems can be used to differentiate between healthy and clinically affected individuals.[5] The aim of the present study was to assess the epidemiological profile of TMD patients treated at the dental clinic of Paulista University (Brazil). In addition, this study sought to identify the relationship among instruments used to screen and diagnose temporomandibular disorders.

**Materials and Methods**

A retrospective study was conducted using medical records of patients with TMD who had visited the institutionforan initial assessment between January and December 2015. It included male and female patients aged 18 to 60 years who exhibited at least mild TMD according to the FAI. The following exclusion criteria were applied: missing teeth without proper rehabilitation; deep bite; crossbite; use of misfit prostheses (partial or total dentures); history of trauma to the face or TMJ; systemic diseases (arthritis, arthrosis or dystonia).

The medical history and physical examination data, particularly those related to the diagnosis of TMD and TMJ function, were collected, including mouth opening (inter-incisor distance) and pain during muscle palpation (recorded on a scale of 0 to 10). The following instruments were used to assess the severity of the TMD signs and symptoms: Fonseca Anamnestic index (FAI), Helkimo index (HI), American Association of Orofacial Pain Questionnaire (AAOPQ), and Jaw Symptom & Oral Habit Questionnaire (JSOHQ).

The FAI was used to assess the severity of TMD based on signs and symptoms. It consists of ten items with three response options: yes (10 points), sometimes (5 points) and no (0 points). The score is determined by adding the scores of all items and provides the following classifications: absence of TMD signs and symptoms (0-15 points); mild TMD (20-45 points); moderate TMD (50-65 points) and severe TMD (70-100 points).[3]

Concerning the Helkimo index,[9] the present study used the clinical dysfunction index, which involves a functional assessment of the masticatory system. According to the presence and intensity of the symptom, a score of 0, 1 or 5 points was assigned to each patient. The following symptoms were analyzed: 1- Range of mandibular motion; 2- TMJ functional impairment; 3- Muscle pain during palpation; 4- TMJ pain during palpation; 5- pain during mandibular movement. The sum of the scores was used to classify the subjects as follows: 0 points - clinically free from symptoms; 1-4 points– mild dysfunction symptoms; 5-9 points – moderate dysfunction symptoms; 10-25 points – severe dysfunction symptoms.

The AAOP Questionnaire contains 10 self-explanatory questions (“yes” and “no” answers) on the most frequent signs and symptoms of oro facial pain and TMD. The Helkimo patient-history index (modified by Fonseca) contains 10 self-explanatory questions (“yes” and “no” answers) based on different symptoms of masticatory dysfunction.[7]

The Jaw Symptom & Oral Habit Questionnaire (JSOHQ) contains 13 questions, eight of which are related to jaw pain and five related to jaw function.

There are five possible answers to each question, ranging from no sign or symptom to extreme signs or symptoms. For analysis, the answers were converted into an ordinal ranking system (0 to 4).

All instruments were completed by dentistry undergraduate students and checked and corrected by a single researcher (PRP). The data were analyzed using descriptive and correlational statistics and SPSS v. 18.0 for Windows (SPSS Inc, Chicago, IL). The results were considered statistically significant for $p<0.05$. The present study was approved by the Research Ethics Committee of the Faculty of Dentistry of the UNIP.

## RESULTS

In the present study, the records of 57 patients who had received care for the first time during the study period were gathered. Of these, 38 fulfilled the inclusion criteria. There was prevalence of women (84.6%), white skin (76.9%), mean age 37.42 ± 14.32 years and mean body mass index 23.94 ± 3.98 kg/cm$^2$. Most patients reported some form of systemic disease (60.5%), with 18.4% mentioning depression. Ten women reported using oral contraceptives. Five main categories of pain were identified: facial pain (31.6%); difficulty while chewing (28.9%); headache (10.5%); bruxism and tooth clenching (7.9%) and clicking noises in the TMJ (5.3%). Twenty-two of the patient records mentioned difficulties while chewing and 21 patients reported parafunction. The maximum mouth opening values ranged from 31 to 60 mm (mean of 42.15 ± 9.34 mm).

Concerning the Helkimo index or clinical craniomandibular dysfunction, the most common form of disorder was severe (18 patients), distributed among the indices 3, 4 and 5 (n=11/5/2), followed by mild (11 patients) and moderate (9 patients). Concerning the FAI, there was a balanced distribution among the patients, who were classified as follows: mild TMD (n=14); severe TMD (n=13) and moderate TMD (n=11).

In the AAOPQ, there was a greater number of positive responses for question 7, referring to the presence of headaches, toothaches and neck pain (n=29), and question 5, referring to the presence of stiffness and fatigue in the jaw (n=26). The results related to the frequency of positive responses are shown in Fig. 1.

The mean score on the Mandibular Symptoms and Oral Habits Questionnaire was 12.34 ± 6.65. Higher scores were obtained for the questions related to difficulty while opening the mouth, discomfort while chewing and joint pain and noises. Fig. 2 shows the sum of the scores for each question.

Pain during muscle palpation was reported in 16 of the records. A greater intensity of pain in the palpated muscles was noted during the intraoral examination. During muscle palpation, the patients were asked to report zero for pain absence and ten

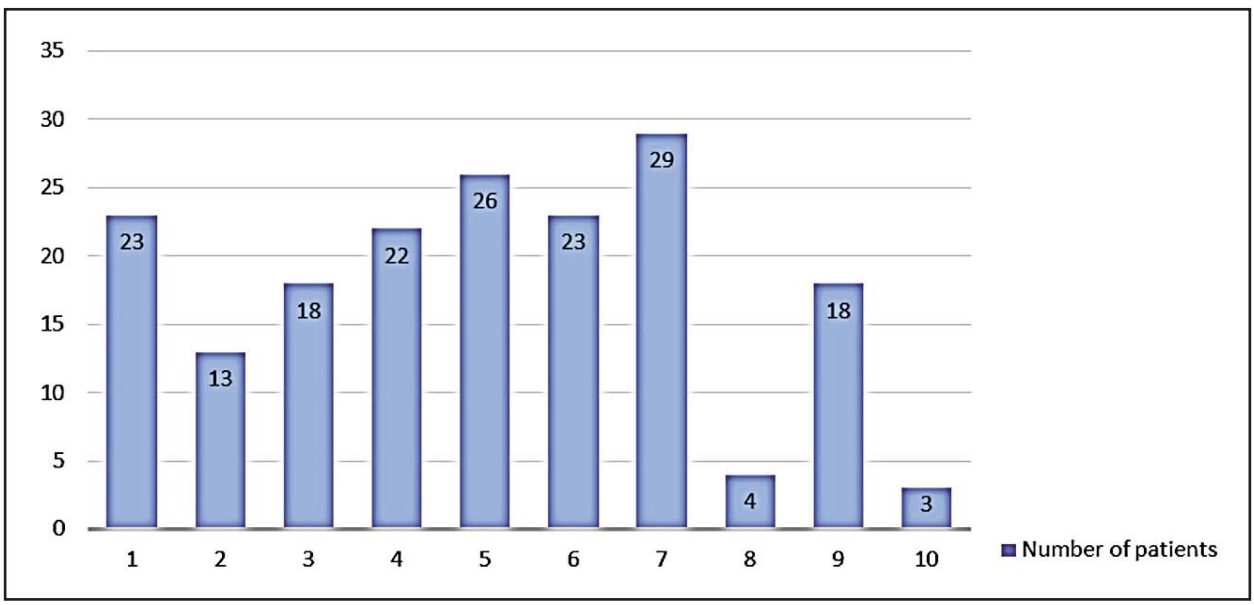
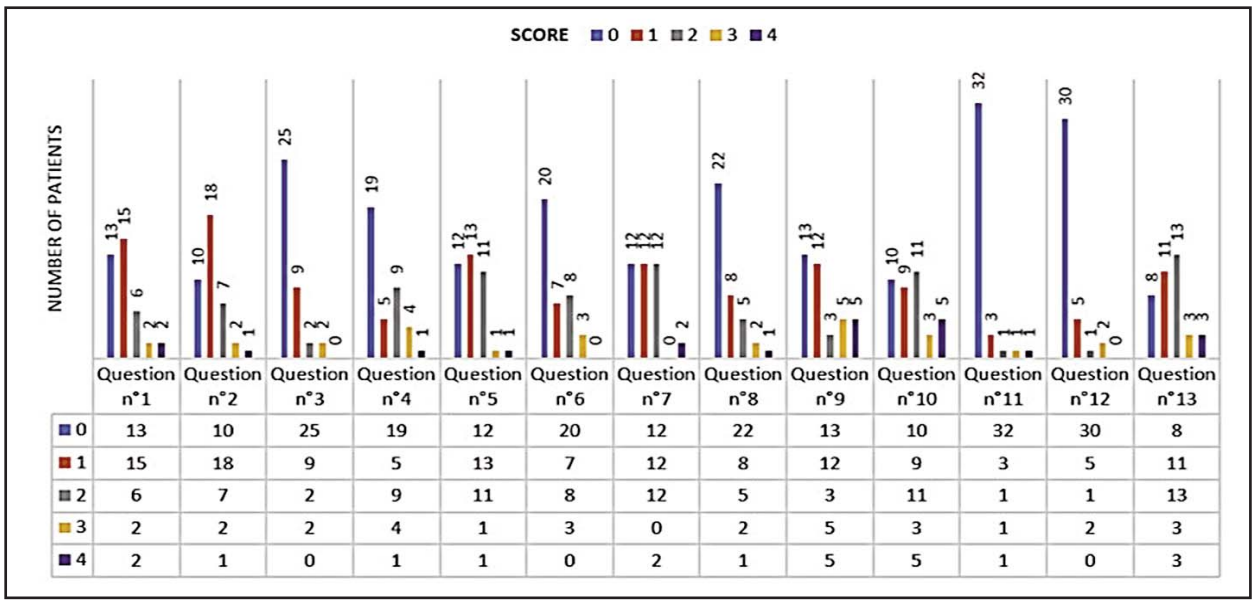



*Fig. 1: Frequency of affirmativeresponseson the American Academy of Orofacial Pain questionnaire.*




| | Question n°1 | Question n°2 | Question n°3 | Question n°4 | Question n°5 | Question n°6 | Question n°7 | Question n°8 | Question n°9 | Question n°10 | Question n°11 | Question n°12 | Question n°13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 13 | 10 | 25 | 19 | 12 | 20 | 12 | 22 | 13 | 10 | 32 | 30 | 8 |
| 1 | 15 | 18 | 9 | 5 | 13 | 7 | 12 | 8 | 12 | 9 | 3 | 5 | 11 |
| 2 | 6 | 7 | 2 | 9 | 11 | 8 | 12 | 5 | 3 | 11 | 1 | 1 | 13 |
| 3 | 2 | 2 | 2 | 4 | 1 | 3 | 0 | 2 | 5 | 3 | 1 | 2 | 3 |
| 4 | 2 | 1 | 0 | 1 | 1 | 0 | 2 | 1 | 5 | 5 | 1 | 0 | 3 |

*Fig. 2: Frequency of the scores for each question of the Mandibular Symptoms and Oral Habits Questionnaire.*

for worst pain experienced. The patients were divided according to average (above and below five). Table 1 shows the results. Table 2 shows the pain results for TMJ palpation.

**Table 1: Patient response in relation to pain during muscle palpation.**

| Muscle/ Side | Right (n) | | Left (n) | |
|---|---|---|---|---|
| **Score** | **Above 5** | **Below 5** | **Above 5** | **Below 5** |
| Anterior temporal | 05 | 11 | 06 | 10 |
| Medial temporal | 02 | 14 | 05 | 11 |
| Posterior temporal | 02 | 14 | 05 | 11 |
| Masseter | 08 | 08 | 09 | 07 |
| Sternocleidomastoid | 06 | 10 | 05 | 11 |
| Digastric | 02 | 14 | 04 | 12 |
| Platysma | 04 | 12 | 04 | 12 |
| Temporal (Intraoral) | 06 | 10 | 09 | 07 |
| Medial pterygoid | 05 | 11 | 08 | 08 |
| Lateral medial pterygoid | 06 | 10 | 08 | 08 |

**Table 2: Patient response in terms of pain during palpation of the TMJ.**

| | Right (n) | | Left (n) | |
|---|---|---|---|---|
| **Score** | **Above 5** | **Below 5** | **Above 5** | **Below 5** |
| Lateral pole | 05 | 11 | 03 | 13 |
| Posterior pole | 04 | 12 | 07 | 09 |

Higher scores were recorded on the Mandibular Symptoms and Oral Habits Questionnaire for patients with severe TMD, according to the Helkimo index (one-way ANOVA, 15.94±5.05, F=7.05; p<0.01), when compared with those with mild TMD (7.10 ±4.65; p=0.002). This difference was not found for patients with moderate TMD, when compared with those with severe TMD (12.27 ±7.87; p=0.258) or those with mild TMD (p=0.127). Table 3 shows the correlation between the Helkimo index and the FAI. A positive correlation (r=0.78; p<0.01) was found between the number of positive responses

**Table 3: Distribution and classification of patients according to the Helkimo Index (The Clinical dysfunction component) and the Fonseca Anamnestic Index.**

| | | Fonseca Anamnestic Index (n) | | | |
|---|---|---|---|---|---|
| | | **Mild TMD** | **Moderate TMD** | **Severe TMD** | |
| Helkimo Index (n) | Score | 20-40 | 45-65 | 70-100 | Total |
| Mild | 1-4 | 7 | 3 | 1 | 11 |
| Moderate | 5-9 | 4 | 3 | 2 | 9 |
| Severe | 10-13 | 2 | 3 | 6 | 11 |
| | 15-17 | 1 | 2 | 2 | 5 |
| | 20-25 | 0 | 0 | 2 | 2 |
| Total | | 14 | 11 | 13 | 38 |

n – number of patients

on the AAOPQ and the sum of the scores on the Mandibular Symptoms and Oral Habits questionnaire. Patients who were classified with severe TMD according to the FAI exhibited higher scores on the Mandibular Symptoms and Oral Habits questionnaire (18.58 ±4.96/ one way ANOVA F=14.43), with a statistically significant difference when compared to patients with moderate TMD (12.08 ±5.64; $p<0.01$) and mild TMD (7.46 ±4.89; $p<0.01$).

Patients who were classified with severe TMD by the FAI exhibited more positive responses on the AAOPQ (6.25 ±1.42; one way ANOVA F=15.82), with a statistically significant difference when compared to patients with mild TMD (3.0 ±1.22; $p<0.01$). No significant difference was found between patients with severe and moderate TMD (5.69 ±1.93; $p=0.648$).

## DISCUSSION

In general, all the indices used sought to assess the frequency and severity of the symptoms associated with TMD.[4,7] Patients with TMD may suffer from myalgia and joint disorders, which contribute to the diversity of the signs and symptoms reported. It was noted that the indices exhibited statistically significant differences when mild and severe disorders were compared using the Helkimo Index and the JSOHQ and when using the FAI and the AAOPQ, with no significant difference found for individuals classified with moderate TMD. This may be due to the fact that the moderate form of the disorder does not differ greatly from the other stages in terms of the frequency of symptoms.

Helkimo was a pioneer in developing indices to measure TMD severity. In an epidemiological study, Helkimo developed an index that was further divided into anamnesis, clinical and occlusal dysfunction. The index sought to identify the prevalence and severity of TMD in the general population.[5,9,10] However, the relationship between the anamnesis, occlusal and dysfunction components of the Helkimo index was not clear.[10] Thus, in the present study, only the dysfunction index was used, similarly to a previous study.[11] The Fonseca Anamnestic Questionnaire is a modified version of the Helkimo anamnestic index and is one of the few instruments available in Portuguese that assesses the severity of TMD symptoms[12] Despite the similarities in the results for TMD severity calculated by the FAI and the HI, they were not identical. These indices exhibit certain similarities among the symptoms studied, such as pain upon opening the mouth; pain in the TMJ and joint noises. Nevertheless, the HI is an objective clinical assessment, whereas the FAI is a questionnaire in which the patient indicates the presence or absence of the symptom studied. In addition, none of the indices provide a complete assessment and consequently, flaws are to be expected.

A positive correlation was found between positive responses on the AAOPQ and the sum of the scores on the JSOHQ. This can be explained by the fact that the questions deal with equivalent subjects, which contributed to the similarity of the results. The equivalent JSOHQ and AAOPQ questions are (question/question): 1/1 – pain or difficulty opening the mouth; 2/3 – pain during mandibular function/ while chewing; 9/4 – joint noises; 11-12/5 – locking of the jaws; 5/6 – pain in the TMJ.

Manfredi et al. [8] assessed the sensitivity and specificity of the questionnaire used for screening orofacial pain and TMD, as recommended by the American Academy of Orofacial Pain. A correlation was found between positive responses and the clinical findings of the specific anamnesis for TMD. Questions 3 and 5 deal with the characteristic pains of TMD such as difficulty and/or pain when chewing or talking, as well as a feeling of tiredness in the jaws. These are the most significant in the questionnaire, due to the link with occlusal conditions and the presence of habits such as grinding or clenching teeth. The authors noted that the questionnaire is sensitive and correlated with extracapsular pathologies or myogenic disorders in which the main complaint is diffuse facial pain. Franco-Micheloni et al. [13] showed that questions 8 and 10 of the AAOPQ demonstrated low and non-significant inter-item correlations with the clinical findings, corroborating their low contribution to the questionnaire. More than two positive answers for the eight item questionnaire could be used as a threshold for the detection of TMD. Campos et al.[6] conducted a study on 700 women to assess the validity and reliability of the FAI. They identified that questions 4, 8 and 10 hindered the internal consistency of the instrument. When these questions were excluded, the FAI exhibited satisfactory internal consistency. The FAI exhibited a high degree of diagnostic accuracy and can be used to identify myogenous TMD in women.[3]

Chaves et al.[4] suggested that the FAI has not yet been completely validated and does not offer a diagnostic classification of TMD. Thus, data obtained using this index are restricted to the classification of the severity of the signs and symptoms of TMD.

In the present study, the classification of severity (according to the FAI) enabled us to establish a statistically significant difference in relation to the JSOHQ scores for mild, moderate and severe stages of the disorder. This was possible due to the similarity of the questions concerning the presence of signs and symptoms, such as (FAI question/ JSOHQ question): 1/1- pain upon opening the mouth; 2/2- pain while chewing/moving the mandible; 3/3- muscle fatigue; 6/5- pain in the TMJ region; and 7/9 – joint noises.

The AAOPQ and the FAI seem to be ideal tools for initial patient screening because they are quick to apply and cost-effective, and are thus also appropriate for large epidemiological studies. The severity of TMD in the FAI and the number of positive responses in the AAOPQ can help clinicians decide whether a more comprehensive assessment is required to obtain a definitive TMD diagnosis.[13] The FAI and the AAOPQ are somewhat similar in terms of the signs and symptoms assessed (FAI question/AAOPQ question): 1/1: difficulty in opening the mouth; 2/3 – difficulty in moving the mandible; 3/5 – fatigue in the jaws; 4/7 - headaches; 6/6 – pain in the TMJ region (pre-auricular); 9/9 – abnormal occlusion/bite.

Several studies have sought to analyze the relevance of certain questions within the instruments used in the present study.[6,8] Several authors have proposed the removal of questions that do not seem to contribute to the diagnosis or classify the severity of the disorder. In fact, none of these instruments are flawless. However, considering that these indices include very similar questions and provide consistent results, is it necessary to use all of them? Which instrument should be selected for diagnosis and which should be used for classification? How should the results of a certain treatment protocol be monitored?

There is consensus in the literature concerning diagnostic instrument: the RDC/TMD has been accepted as a universal diagnostic instrument for TMD. It was proposed in 1992 by Dworkin and Leresche[14] and has been accepted and used in several clinical and epidemiological studies.[15] Moreover, it is continuously being improved.[16] Concerning classification, the present study considered two instruments (Helkimo and FAI), of which the latter seemed to be more adequate since it reducesthe number of categories and has been used recently in the literature. The authors of the present study monitored the results.

No diagnostic or assessment instrument should be used in place of a physical examination. Unfortunately, clinical data were not found for all of the patients, which prevented comparisons with the indices. The present study has the limitations that are inherent to retrospective studies: limited sample size; it did not use RDC/DTM in the diagnosis; and the inclusion of patients. Further studies could rationalize the selection of the assessment instrument in accordance with the objective, either to identify whether or not patients have the disorder or to classify, diagnose or monitor/compare the results of different treatment protocols. This study should be viewed as a preliminary study seeking to highlight an issue of paramount importance: how to select instruments correctly when assessing TMD.

In the study sample, there was consistency among the instruments used to distinguish between patients with severe TMD symptoms and patients with mild TMD symptoms, since the same topics (signs and symptoms) are covered by most of the instruments. The use of two or three of these instruments does not guarantee a more accurate diagnosis because most of them were created as a selection tool or to classify the severity of disease. Further studies could associate instruments for diagnosis such as RDC/TMD with instruments to classify the severity of disease such as Fonseca Anamnestic index and Helkimo index.

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