



Temporomandibular Disorders and Fibromyalgia: A Narrative Review

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Abstract

Temporomandibular disorder (TMD) and fibromyalgia (FM) have some clinical characteristics in common, for instance the chronic evolution, the pathophysiology incompletely understood and a multifactorial genesis. The incidence and the relationship between TMD and FM patients are the aims of this review. A MEDLINE and PubMed search were performed for the key words "temporomandibular disorder" AND "fibromyalgia" from 2000 to present. A total of 19 papers were included in our review, accounting for 5449 patients. Ten studies, reporting a total of 4945 patients with TMD, showed that only 16.5% of these patients had diagnosis of FM, whereas 12 studies, reporting a total of 504 patients with FM, demonstrated that 77.0% of these patients had diagnosis of TMD. A comorbid relationship exists between TMD and FM. The complexity of both diseases shows the importance of a multimodal and interdisciplinary.

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Introduction

Temporomandibular disorders (TMDs) describe a variety of dysfunctions and pain related to the masticatory system and characterized by craniofacial pain involving the joint, masticatory muscles, muscle innervations of the head and the neck, functional movement limitations of the mandible, clicking sounds, or grinding and clenching. TMD represents the major cause of non-dental pain in the orofacial region and the second most common musculoskeletal condition (after chronic low back pain) resulting in pain and disability. Although most common signs and symptoms of TMD are muscle pain in the head, neck, and noise, pain in the temporomandibular joint (TMJ), symptoms such as headache, facial and nape pain, dental pain, tinnitus, and dysgeusia can be present.

The research diagnostic criteria for TMD (RDC/TMD) were introduced by Dworkin and LeResche in 1992 [1]. RDC/TMD has substantially contributed to TMD research by providing detailed standard instructions,

comprising a dual-axis approach, and identified three different subtypes, which are TMJ disorders (joint pain, arthralgia, and joint disorders), masticatory muscle disorders (muscle pain, contracture, and movement disorders), and headache [1]. Fibromyalgia (FM) is a chronic rheumatic syndrome characterized by body-wide musculoskeletal pain, asthenia, anxiety, and sleep impairments [2]. Diagnosis is confirmed after 3 months of widespread pain and tenderness in 11 of 18 musculoskeletal locations. Other symptoms reported in FM patients are chronic headache, stress, morning stiffness, fatigue, and mood disorders [3], [4]. These signs and symptoms are also frequently diagnosed as part of TMD.

TMD and FM have some clinical characteristics in common, for instance the chronic evolution, the pathophysiology incompletely understood, the serious physical and psychological impact, the shared predisposing factors, and a multifactorial genesis [2]. Pain-related TMD as also FM can impact on individual's daily activities, psychosocial functioning, and quality of life. Pain is determined by a complex interaction between

mechanical, biological, and cognitive factors; however, there are in addition predisposing morphostructural (anatomical alterations) and psychoemotional (stress and anxiety) factors. The incidence and the relationship between TMD and FM patients are the aims of this review. We report the incidence and the clinical features of FM in patients with TMD as also the incidence and the clinical characteristics of TMD in patients with FM to better understand their relationship.

Materials and Methods

A MEDLINE and PubMed search were performed for the key words “temporomandibular disorder” AND “fibromyalgia” from 2000 to present. Only reports in English were used. Case reports, reviews, and series reporting animal studies were excluded from the study. Studies were also excluded if they did not report any clinical association data between TMD and FM or if they reported clinical studies in children. Eligibility assessment was performed independently in an unblinded standardized manner by two reviewers. Disagreements between reviewers were resolved by consensus. Collected data were used for the final analysis, whose endpoints were to evaluate the clinical association and relationship between TMD and FM, and vice versa. The flowchart for criteria and inclusion is presented in Figure 1.

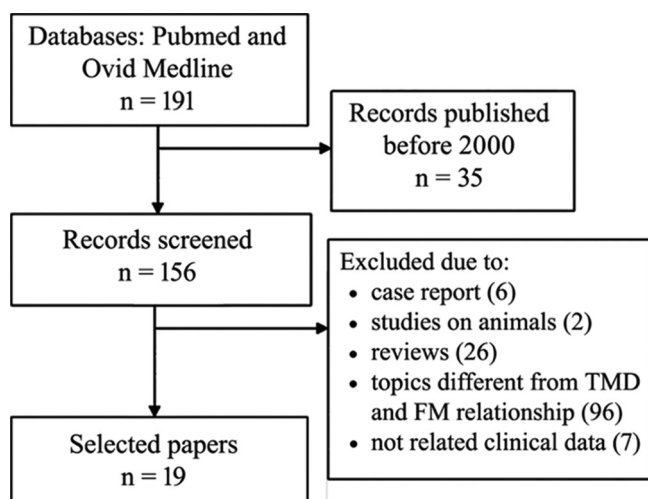


Figure 1: Flow diagram of the study selection

Results

The PubMed and Ovid Medline databases search yielded 156 records (Figure 1). Accordingly with the exclusion criteria, 137 records were discarded as follows: Case report (6), studies on animals (2), reviews

(26), topics different from clinical relationship between TMD and FM (96), and absence of related clinical data (7). A total of 19 papers were included in our review, accounting for 5449 patients [5], [6], [7], [8], [9], [10], [11], [12], [13], [14], [15], [16], [17], [18], [19], [20], [21], [22], [23], [24]. Ten studies (Group 1), reporting a total of 4945 patients (72% were female) with TMD, showed that only 16.5% of these patients had diagnosis of FM, whereas 12 studies (Group 2), reporting a total of 504 patients with FM (97.7% were female), demonstrated that 77.0% of these patients had diagnosis of TMD. Tables 1 and 2 show all details.

Four different studies provided details about more specific symptoms in patients with TMD, reporting an overall value in pain during mandibular movements, orofacial pain at rest, and headache in 21.2%, 63.7%, and 35.7% of patients, respectively [13], [15], [17], [24]. Similarly, five studies reported data regarding pain during mandibular movements, orofacial pain at rest, and headache in patients with FM, which were 68.8%, 66.5%, and 81.2%, respectively [8], [10], [11], [20], [21].

Discussion

TMD and FM are widely prevalent problems mostly in women but also in men and they include an array of musculoskeletal disorders from muscle contracture and myofascial pain syndrome to degenerative TMJ disease, even if widespread pain and tenderness on palpation are more common in patients with FM. FM is a rheumatic pain syndrome and it is often associated with sleep disturbance, fatigue, and often psychological distress [5]. It was reported that widespread pain, depression, and sleep disorders associated with FM may play a significant role in the chronicity of patients with TMD [5].

TMDs comprise several of pathologic conditions characterized by pain and tenderness in the TMJs and/or in the masticatory muscles and may reach the preauricular area [3].

These conditions also include functional movement limitations of the mandible, clicking sounds, or grinding and clenching. It occurs in young adults age 20–40 years, mostly in women [4], [6].

A high prevalence of TMDs in patients with FM suggests comorbidities and the need to consider the signs and symptoms of TMDs in the diagnosis of FM to improve pain management in these patients.

FM and TMD have signs and symptoms in common, aside from the pathophysiology and the biochemical mechanisms which cause them that are not so good understood until now.

Mechanisms that characterize chronic pain conditions in FM and TMDs are different. These

Table 1: Data summary of the 10 included studies analyzed in the systematic review, reporting patients with TMD

Authors	Year	Patients with TMD n	Age (mean)	M/F	Patients with FM (%)	Pain in mandibular movements (%)	Orofacial pain (%)	Headache (%)
Aaron <i>et al.</i> [6]	2000	25	38	-	2 (8)	-	-	-
Manfredini <i>et al.</i> [18]	2004	30	-	-	3 (10)	-	-	-
Leblebici <i>et al.</i> [16]	2006	21	35.2	0/21	11 (52)	-	-	-
Velly <i>et al.</i> [23]	2010	572	35.5	69/572	60 (11)	-	-	-
Hoffmann <i>et al.</i> [13]	2011	1511	41	151/1360	317 (21)	272 (18)	-	816 (54)
Eisenlohr-Moul <i>et al.</i> [9]	2015	28	45	0/28	11 (39.3)	-	-	-
Janal <i>et al.</i> [14]	2016	125	39	0/125	26 (20.8)	-	27 (21.6)	-
Losert-Bruggner <i>et al.</i> [17]	2018	555	45	199/356	351 (63.2)	167 (30.1)	457 (82.3)	262 (47.2)
Jussila <i>et al.</i> [15]	2018	1962	46	912/1050	26 (1.3)	-	-	352 (17.9)
Vivaldi <i>et al.</i> [24]	2018	116	43.5	39/77	9 (7.8)	-	23 (19.8)	51 (43.9)
Total studies	-	4945	42.8	-	816 (16.5)	439 (21.2)	507 (63.7)	1481 (35.7)

TMD: Temporomandibular disorder, FM: Fibromyalgia.

Table 2: Data summary of the twelve included studies analyzed in the systematic review, reporting patients with FM

Authors	Year	Patients with FM n	Age (mean)	M/F	Patients with TMD (%)	Pain in mandibular movements (%)	Orofacial pain (%)	Headache
Aaron <i>et al.</i> [6]	2000	22	48.5	-	5 (22.7)	-	-	-
Olson <i>et al.</i> [19]	2000	20	-	1/19	12 (60)	-	-	-
Rhodus <i>et al.</i> [21]	2003	67	47.6	0/67	45 (67.2)	25 (37.3)	-	-
Manfredini <i>et al.</i> [18]	2004	30	-	-	26 (86.7)	-	-	-
Leblebici <i>et al.</i> [16]	2006	31	35.2	0/31	25 (80)	-	-	-
Balasubramaniam <i>et al.</i> [7]	2007	32	52.2	0/32	19 (59.4)	-	6 (18.8%)	-
Salveti <i>et al.</i> [22]	2007	93	50.1	5/88	74 (79.6)	-	-	-
Fraga <i>et al.</i> [10]	2012	60	49.8	8/52	49 (81.7)	17 (28.3)	49 (81.7)	58 (97)
Da Silva <i>et al.</i> [8]	2012	25	47.7	1/24	22 (88)	12 (48)	-	8 (32)
Pimentel <i>et al.</i> [20]	2013	40	51.5	0/40	31 (77.5)	-	34 (85)	-
Gui <i>et al.</i> [12]	2013	31	53	0/31	27 (87.1)	-	-	-
Fujarra <i>et al.</i> [11]	2016	53	50	0/53	53 (100)	41 (77.4)	34 (64.2)	46 (86.8)
Total studies	-	504	48.9	-	388 (77.0)	95 (68.8)	123 (66.5)	112 (81.2)

TMD: Temporomandibular disorder, FM: Fibromyalgia.

mechanisms are central sensitization, impairment of the descending pain inhibitory system, neuronal convergence (which explain the clinical manifestations of chronic pain conditions), an higher blood levels of serotonin (5-HT) [25] after exercising and lower blood flow in the masseter muscle. These claims are supported by various studies such as Guo *et al.* [26] and Okamoto *et al.* [27], [28].

Jackson and O'Farrell [24] demonstrated that oxidative stress can cause muscle damage and therefore be involved in many diseases like FM that affects the muscles [24].

In the past few years, several studies have demonstrated the presence of reactive oxygen species markers in FM, which would confirm their involvement in the pathophysiology of the disease [23], [24], [29].

Considerable indirect evidence seems to indicate that not only increased pain facilitation but also ineffective pain inhibition represents a predisposition for chronic pain. This view is supported by the fact that many chronic pain syndromes (e.g., FM, TMJ disorder, irritable bowel syndrome, headache, and chronic fatigue syndrome) are associated with hypersensitivity to painful stimuli and reduced endogenous pain inhibition [30].

The literature indicates that coexistence of FM and TMD with matrix metalloproteinases is high. Pain and tenderness in the masticatory muscles appear to be an important element in FM, so in some patients, it may be the leading complaint.

Chronic orofacial myalgia is characterized by muscle pain, tenderness, stiffness, and restricted range of mandibular movement. It can be localized and due to TMDs, or part of a generalized myalgia, for example, FM.

All the above evidence allows us to conclude that there is solid scientific support for the comorbid relationship between TMD and (1) headache, (2) chronic syndrome disease, and (3) FM. Nonetheless, in spite of the continuing advances in the pathophysiological mechanisms and the methodological designs, there are still some doubts regarding the nature of this comorbidity. The mentioned pain mechanisms, that is, central sensitization, impairment of the descending pain inhibitory system, and neuronal convergence, are more likely to explain the clinical manifestations of chronic pain conditions, rather than dissect specific underlying mechanism of chronic painful comorbidities.

Yet, the basic foundation supporting this review data is that TMD, headache, cervical spine disorder, and FM are distinct diseases. Nevertheless, such proposition has become fragile, considering the great similarity among the underlying mechanisms driven all of them, as already presented.

TMD is a local disorder and FM a generalized disorder, and there is less evidence of distress in those with TMD. TMD is a separate disorder from FM, but many patients with FM have TMD symptoms.

Plesh *et al.* [31] in their studies found that a small proportion of patients with TMD (18.4%) also had FM, but most of those with FM (75.0%) satisfied criteria for muscular (myofascial) TMD. Patients with FM had lower pain thresholds and more severe manifestations of all disease measures (e.g., pain, fatigue, sleep, etc.) compared to those with TMD. As might be predicted, they also had more painful body regions. Patients with FM also differed significantly from those with TMD in self-reported work ability and health assessment. The features that best differentiate FM from TMD

are functional disability, reports of work difficulty, and general dissatisfaction with health.

Fraga *et al.* [10] and Fugarra *et al.* [11] reported a high incidence of TMD in patients with FM (81.7% and 100%, respectively), in particular with regard to pain during mandibular movements (28.3 and 77.4%, respectively), orofacial pain (81.7% and 64.2%, respectively), and headache (97% and 86.8%, respectively). Similarly, Leblebici *et al.* [16], identifying two groups of patients (21 patients with TMD and 31 patients with FM), reported a high clinical associations between FM and TMD and vice versa. Balasubramaniam *et al.* [6] reported a high prevalence of TMD among FM patients too. Rhodus *et al.* [21] observing 67 patients diagnosed with FM (all women, mean age 47.6 years old), found a significant incidence of orofacial symptoms compared with control data, including xerostomia (70.9% vs. 5.7%), glossodynia (32.8% vs. 1.1%), TMD (67.2% vs. 20%), and dysphagia (37.3% vs. 0.4%). Fugarra *et al.* [11] reported in their study that all FM patients had TMD symptoms; however, there were some differences between different groups depending on the onset of facial pain indicating that it is important to identify if facial pain or generalized body pain came first in the evaluation and treatment of the patients.

Although TMD and FM share common symptoms, including generalized pain sensitivity, sleep and concentration difficulties, bowel complaints, and headache; myofascial pain, including masticatory muscles, is a common finding in FM patients, whereas intra-articular TMJ disorders are not symptoms of FM.

Analyzing data in the literature about this issue, several studies [16] reported an involvement of the stomatognathic system in the course of FM syndrome similar to that characterizing TMDs, a heterogeneous group of pathologies affecting masticatory muscles, TMJs, and their associated structures [32]. Some studies showed that a high percentage of TMD patients report muscle tenderness and stiffness in other body regions that may be directly related to FM, and a discrete prevalence rate of FM among TMD patients has been documented as well [33], [34], [35], [36], [37].

This last observation applies to patients with muscular TMD, in particular, and raises questions about the interpretation of myofascial face pain (MFP) in those cases, as this clinical condition shares several clinical features with FM. For example, it was suggested that MFP and FM might represent a different expression of the same condition [38]. They were considered as distinct disorders characterized by the same underlying pathophysiology [39]. MFP was suggested to be a regional expression of FM [34], and it was also hypothesized that MFP and FM represent the extremities of a clinical continuum [40].

Based on present knowledge, FM and MFP should be viewed as different pathologies for many reasons. First, MFP affects a restricted group of

muscles, with a regional localized pain characterized by the presence of trigger points (TrPs), while FM is a systemic disease characterized by widespread pain and the presence of tender points (TePs). MFP typically arises as a response to an acute trauma or to a chronic overload of the stomatognathic system, as in the case of bruxism [41], while FM has an insidious onset with an incompletely known etiology, in which biochemical alterations, neuroendocrine abnormalities, and central sensitization mechanisms play an important role [42], [43], [44], [45]. Consequently, TrP characterizing MFP benefits from local treatments, while FM TeP requires systemic treatments [42], [46], [47].

Such observations raise questions about the interpretation of symptoms and signs of stomatognathic dysfunction in FM patients whose comprehension has a strong importance for a correct management of the patient with symptoms and signs involving the stomatognathic system.

Analyzing the prevalence of the different RDC/TMD diagnoses among patients with FM, it was observed that myofascial pain was present in 40.9%, disk displacement in 29%, and arthralgia, osteoarthritis, and osteoarthrosis in 71% of patients. Only some patients presented myofascial pain, while a high percentage presented inflammatory degenerative disorders. These results are in contrast with those observed by Plesh *et al.* [31] who found a prevalence of myofascial pain equal to 75%. Pain and musculoskeletal rigidity characterizing FM can often involve the masseter muscles and the TMJs.

The overall prevalence of painful conditions (myofascial pain with or without limited opening, arthralgia and osteoarthrosis) was 62.4% (n = 58) in patients with FM. These data agree with those from other studies [31], suggesting that orofacial pain is generally secondary to the onset of widespread musculoskeletal pain and that only in rare cases can TMD represent a first manifestation of chronic pain conditions.

Losert-Bruggner *et al.* [17] investigating the relationships between FM and craniomandibular dysfunction, reported that 63% of TMD patients fulfilled the diagnostic criteria of FM. Different studies reported that the presence of some conditions, such as migraine and FM, is associated with increased TMD intensity and duration. The complexity of both diseases shows the importance of a multimodal and interdisciplinary diagnosis. Salvetti *et al.* [22] provided data about the high rate of orofacial involvement in course of FM syndrome, suggesting that FM may sometimes represent an etiologic factor for TMD, and in particular, seem to have a worsening effect on the outcome of TMD. Pimentel *et al.* [20] showed that myofascial pain can be considered an important factor in FM diagnosis with a high coexistence of TMD. Thus, FM can be considered a predisposing factor for the development of TMD.

The results in the study of Salvetti *et al.* [22] suggest that facial pain in patients with TeP could be an integrating part of FM, while facial pain in patients with TrP is probably an expression of myofascial pain as described by Simons *et al.* [48]. Clinicians should know the peculiar characteristics of TeP and TrP [42], [49], [50], [51], [52], [53], [54], [55], [56] to make a differential diagnosis between localized and systemic muscle disorders, which may overlap in symptoms [57], and to detect the correct origin of facial pain. In fact, orofacial pain in FM patients with TePs seems to be related to the syndromic picture, while in those with TrPs, it seems to be an expression of MFP. In the case of TMD patients, some different suggestions can be drawn, since orofacial pain in the presence of TrPs is commonly related to MFP, but pain accompanied by the presence of TePs might represent a manifestation of a systemic disease, such as FM.

In view of such considerations, the dentist should know the basic principles useful to intercept patients whose orofacial symptoms could represent a manifestation of a systemic disease, since such patients have no benefit from local treatments [58] and need specific treatments involving the rheumatologist.

Conclusions

A comorbid relationship exists between TMD and FM. The lowering of prognosis of outcomes for TMD patients with FM (only 5% sustained remission after treatment) highlights the importance of recognizing whether the symptoms of a chronic TMD patient have origins in FM [5].

A comprehensive evaluation of patients with FM and TMD is necessary to identify specific treatments for orofacial complaints, pain in mandibular movements, and headache. Future studies, especially those with longitudinal design, should help clarify the role of orofacial complaints and TMJ disorders in patients with TMD and FM. To prevent and treat these chronic debilitating conditions, patients with TMD and FM need a careful multidisciplinary approach. To improve TMD and FM symptoms as also other existing comorbidities, it is necessary a more extensive interdisciplinary basic and clinical research and the development of outcome-based strategies to more effectively diagnose.

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