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## Prevalence of temporomandibular disorder in patients with fibromyalgia

*a systematic review*

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**Prevalence of temporomandibular disorder in patients with fibromyalgia: a systematic review****Prevalência de distúrbio temporomandibular em pacientes com fibromialgia: uma revisão sistemática**

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**ABSTRACT**

**INTRODUCTION:** Temporomandibular Disorders (TMDs) and Fibromyalgia (FM) may share similar signs and symptoms. Among them, muscle pain may be involved and significantly reduce the quality of life of these patients.

**AIM:** The aim of this systematic review was to determine the prevalence of TMD in patients with FM.

**MATERIALS AND METHODS:** In this systematic review six electronic databases (LILACS, LIVIVO, PubMed, ScienceDirect, PsycINFO, and Web of Science), as well as three grey literature databases (Google Scholar, Open Grey, and ProQuest) were searched. Cross-sectional studies were selected by two independent reviewers and analyzed in two-phases, following the PRISMA statement. Risk of bias was assessed through the MASTARI (Meta-Analysis of Statistics Assessment and Review Instrument for observational studies from the Joana Briggs Institute).

**RESULTS:** From 660 articles, 51 were eligible for full-text reading and six were finally included. None of the articles met all quality methodological criteria. Therefore, considering the overall risk of bias, one article was judged with moderate risk and five with low risk of bias. A heterogeneity was considered high; thus, a meta-analysis was not performed. From the qualitative analysis it was possible to determine that between 13% to 87.1% of patients with FM can present TMD.

**CONCLUSION:** The prevalence of TMD in patients with FM ranged from 13% to 87.1%. It is suggested that further studies be carried out, mainly with longitudinal design and better quality methodology to help answer whether fibromyalgia is a risk factor for the development of TMDs.

**Keywords:** Cross-sectional studies, signs and symptoms, chronic pain syndrome.

**RESUMO**

**INTRODUÇÃO:** Distúrbios Temporomandibulares (TMDs) e Fibromialgia (FM) podem compartilhar sinais e sintomas similares. Entre eles, a dor muscular pode estar envolvida e reduzir significativamente a qualidade de vida desses pacientes.

**OBJETIVO:** O objetivo desta revisão sistemática foi determinar a prevalência das DTMs em pacientes com FM.

**MATERIAIS E MÉTODOS:** Nesta revisão sistemática foram pesquisados seis bancos de dados eletrônicos (LILACS, LIVIVO, PubMed, ScienceDirect, PsycINFO e Web of Science), bem como três bancos de dados de literatura cinzenta (Google Scholar, Open Grey e ProQuest). Os estudos transversais foram selecionados por dois revisores independentes e analisados em duas fases, seguindo a declaração do PRISMA. O risco de enviesamento foi avaliado através do MASTARI (Meta-Análise de Avaliação Estatística e Instrumento de Revisão para estudos observacionais do Instituto Joana Briggs).

**RESULTADOS:** De 660 artigos, 51 foram elegíveis para leitura de texto completo e seis foram finalmente incluídos. Nenhum dos artigos atendeu a todos os critérios metodológicos de qualidade. Portanto, considerando o risco geral de viés, um artigo foi julgado com risco moderado e cinco com baixo risco de viés. Uma heterogeneidade foi considerada alta; assim, uma meta-análise não foi realizada. A partir da análise qualitativa foi possível determinar que entre 13% a 87,1% dos pacientes com FM podem apresentar DTM.

**CONCLUSÃO:** A prevalência da DTM em pacientes com FM variou de 13% a 87,1%. Sugere-se a realização de mais estudos, principalmente com desenho longitudinal e metodologia de melhor qualidade para ajudar a responder se a fibromialgia é um fator de risco para o desenvolvimento das DTM.

**Palavras-chave:** Estudos de corte transversal, sinais e sintomas, síndrome da dor crônica.

**1 INTRODUCTION**

Fibromyalgia (FM) was recognized as a disease by the WHO in 1992 and from that moment on, the scientific community showed great interest in the subject. Studies carried out in the USA and Europe show that the prevalence can reach up to 5% in the population in general [1], but clinical care represents more than 10% in rheumatological clinics [2]. In addition, FM is known as a chronic pain syndrome with complex multifactorial etiopathogenesis, not yet fully understood, characterized by multiple painful and diffuse regions. It is also frequently associated with sleep disorders, fatigue, somatic symptoms, cognitive and psychological disorders [3]. This condition mainly affects women between 30 and 60 years of age [4].

Over the years, the diagnostic criteria for FM have been changing. Currently, the American College of Rheumatology (RCA) takes into account: generalized pain index (GI) and symptom severity scale (EGS) [2]. Above all, these symptoms must be present for at least three months and the patient should not present any other pathological condition that can explain their pain [5].

Beyond the physical and cognitive disorders, about 45% of patients may present with other diseases and musculoskeletal conditions(6), one of the most frequent ones reported in the literature are TMDs [7,8].

The TMDs cover a series of functional alterations in the chewing muscles, temporomandibular joint and associated orofacial structures [9]. These dysfunctions have a multifactorial etiology, predominate among women and usually have a recurrent and chronic course, and the most common signs and symptoms are noise in the joints, headache, pain in the pre-auricular region, otalgias, muscle tiredness, but the pain in general it is the most frequent symptom and important factor reported by patients [10]. Studies in the literature suggest that the psychological situation of patients who have some type of temporomandibular disorder, may present abnormal reactions to stress, having low ability and low pain tolerance threshold, indicating an important interrelation of these factors, and there is also an impact of this chronic pain in your daily activities.

Previous studies [11,12] have shown an intimate relationship between FM and TMD, emphasizing that the two conditions presented problems related to a central nervous system senility, are the FM patients who report the lowest quality of life indexes [13]. On the other hand, it can be understood that fibromyalgia can lead to chronicity of the signs and symptoms of TMDs [14].

Considering that these two entities may be present together and cause in the patients numerous signs and symptoms that considerably worsen their quality of life, the objective of this study is to verify the prevalence of temporomandibular disorder in patients with fibromyalgia

## 2 MATERIALS AND METHODS

### 2.1 PROTOCOL AND REGISTRATION

A systematic review protocol based on PRISMA-p [15] was performed. The protocol for this systematic review was outlined in 08, august 2018, prior to data collection, and it was registered at the International Prospective Register of Systematic Reviews (PROSPERO) [16] under number CRD42018103975([https://www.crd.york.ac.uk/prospero/display\\_record.php?RecordID=103975](https://www.crd.york.ac.uk/prospero/display_record.php?RecordID=103975)).

### 2.2 ELIGIBILITY CRITERIA

#### 2.2.1 Inclusion criteria

Included observational studies that evaluate the prevalence of co-occurrence between temporomandibular disorders and fibromyalgia in adults (18-65 years old). It embraced studies from all languages and no restriction regarding sex nor time of publication. TMD should be assessed through Research Diagnostic Criteria (RDC/TMD) [17] or Diagnostic Criteria (DC/TMD) [18]. The criteria needed for a diagnosis of fibromyalgia should be according to the American College Rheumatology(5).

#### 2.2.2 Exclusion Criteria

Excluded studies had the following characteristics:; 1) Studies using TMD diagnostic tool other than the RDC/TMD or DC/TMD. 2) Studies where TMD diagnostic criteria were not explored; 3) Studies where Fibromyalgia diagnostic criteria were not explored; 4) Studies with fibromyalgia that does not describe whether it has TMD; 5) Studies with duplicated samples; 6) Incomplete data (articles in which doubts remained as to the methodology or results and that we did not obtain contact with the authors after three consecutive weeks of attempts); 7) Full paper not available; 9) Reviews, letters, conference abstract, personal opinions, case reports;

### 2.3 INFORMATION SOURCES

Electronic search strategies were developed and adapted for each of the following bibliographic databases: Latin American and Caribbean Health Sciences (LILACS), LIVIVO, PubMed (including Medline), ScienceDirect, PsycINFO, and Web of Science. A partial grey literature search was also performed on Google Scholar, Open Grey, and ProQuest (further details provided in Appendix 1). The search was performed on May 15, 2018, but after many months of the first search, it was decided to make an update of the same that occurred on March 18, 2019. Moreover, the list of references of included studies was hand-searched to identify additional

manuscripts, following the recommendation by Greenhalgh and Peacock [19]. Experts were also consulted by email in order to improve search findings. A reference manager (EndNote X7, Thomson Reuters) was used to collect references and remove duplicates.

#### 2.4 STUDY SELECTION

A two-phase process was performed in the selection of studies. In phase-one, titles and abstracts of identified references were independently screened by two reviewers (LPN and KVMT). Studies that did not fulfill inclusion criteria were excluded. In phase-two, the same reviewers applied the eligibility criteria to the full-text of the manuscripts. A third reviewer (FB) was involved if disagreements were discussed and not solved by a consensus. Throughout the process of selection of the studies was used the online software (Rayyan, Qatar Computing Research Institute) [20].

#### 2.5 DATA COLLECTION PROCESS AND DATA ITEMS

When the required data were not complete, the reviewers (LPN and KVMT) attempted to contact the study authors to retrieve any unpublished information. Up to two attempts were made by mail to contact corresponding authors.

Data extraction included the general characteristics of the selected papers: first authors, type of study, country and year in which study was conducted, recruitment of patients and sample characteristics (age and gender).

#### 2.6 RISK OF BIAS IN INCLUDED STUDIES

Two independent reviewers (LPN and KVMT) evaluated the methodological quality of eligible studies following the Meta-Analysis of Statistics Assessment and Review Instrument (MAStARI) for observational studies from the Joana Briggs Institute [19], which assists reviewers in judging questions about the methodology and job description so that they can assess whether or not the studies were performed well, reducing the risk of bias.. The studies were judged according to the following: 1) low risk of bias, if studies reached more than 70% score "yes"; 2) moderate risk of bias, if "yes" scores were between 50% and 69%; and 3) high risk of bias, if "yes" scores were below 49% (Appendix 3) Any disagreement was resolved with the assistance of a third author (FB). Figures were generated using software (Review Manager 5.3; The Cochrane Collaboration).

### 3 STATISTICAL ANALYSIS

A quantitative analysis of the data obtained in the included articles was planned to be carried out using inconsistency indexes ( $I^2$ ) statistical test provided by the program MedCalc Statistical Software version 14.8.1 (MedCalc Software, Ostend, Belgium).

## 4 RESULTS

### 4.1 SEARCH AND SELECTION OF STUDIES

First, 1287 references were identified in the main electronic databases. After the removal of duplicate studies, 660 remained. The search in the grey literature resulted in only one article included. The sections of included studies were done in a two phases process. Abstracts of the 660 references were evaluated in the first phase of the study, of which 51 were considered eligible for reading the full text. In phase-two, only six [8, 14, 23, 24, 25, 26] articles met the inclusion criteria and were considered for analysis. Table/fig 1 exemplifies the complete process of identification and selection of studies. The reasons for excluding phase-two studies are also available in more detail in Appendix 2.

### 4.2 STUDY CHARACTERISTICS

All articles eligible for analysis were classified as cross-sectional according to the JBI [19] reviewer's manual. These articles were published between 2000 and 2016, of which two were carried out in the, one in Brazil [8], two in Italy [14, 25], one in Turkey [26] and two USA [23, 24]. More information on the characteristics of the study is provided in Table/fig 2.

The sample sizes ranged from 22 to 93 participants. A total of 273 FM patients were evaluated in this study. The prevalence of TMD in patients with FM ranged from 13% to 87.1%.

### 4.3 RISK OF BIAS ACROSS STUDIES

None of the studies met all quality methodological criteria. All of them were judged to be at high risk of bias regarding strategies for dealing with sample randomization and confounding factors. In addition, because it is a prevalence study, the issue related to follow-up was considered as not applicable. Therefore, considering the global risk of bias, one article was judged with moderate [26] risk and five [8, 14, 23, 24, 25] with low risk of bias (Table/fig 3 and Appendix 3).

#### 4.4 RESULTS OF INDIVIDUAL STUDIES

The sample sizes ranged from 22 to 93 participants. In all, 273 FM patients were evaluated in this study. The prevalence of TMD in patients with FM ranged from 13% to 87.1%. Three studies [14, 24, 25] presented the prevalence of TMD subgroups.

Balasubramaniam B et al., [24] found that 59.3% (n = 19) of patients with FM had some type of TMD, of those patients diagnosed with TMD 73% (n = 14) were myofascial pain type, 21% (n = 4) disk displacement, arthralgia was diagnosed in 15% (n = 3), TMJ osteoarthritis in 26% (n = 5) and TMJ osteoarthritis in 40% (n = 7).

Di Venere D et al., [14] found that of the 31 patients with FM 80.6% (n = 25) of them had signs and symptoms of TMD. This study also distributed the results according to the TMD subtype; thus, a muscular disorder is present in 84% patients (n=21) had disc displacement, 44% (n = 11) inflammatory and degenerative joint disorders in 12% (n = 3) of the patients. In addition, in 40% of cases, there was a combined diagnosis.

Salvetti G et al., [25] found a prevalence of 79.6% (n = 74) of TMD in patients with FM, of these seventy four patients, 40.9% (n = 38) had some type of muscular TMD, 29% (n = 27) disk displacement with or without reduction and 71% (n = 66) inflammatory-degenerative disorders.

#### 4.5 SYNTHESIS OF RESULTS

Although the articles presented the same criterion for the diagnostic studies, they still presented features of clinical heterogeneity that resulted in a high statistical heterogeneity, data reached by  $I^2$  provided by Medcalc after item data is placed in the program. In this way it was not possible to expose the meta-analysis. When condensing the data in the software, it determines the heterogeneity, in our case it was 92%, considered very high. For this reason, the data from the meta-analysis were not used, as they would not represent reality with similarities. In addition, funnel plot could not be completed due to there were few trials per meta-analysis (less than 10 articles). Thus, a simple percentage calculation was carried out, called the rule of three, obtaining an average of patients who had FM and concomitantly TMD.

### 5 DISCUSSION

The main outcome of this systematic review suggests a high degree of comorbidity between FM and TMD. The meta-analysis of the included articles was not performed because, although all used the same diagnostic criteria, they did not consider only painful TMD, the most common in FM patients, but all the diagnoses creating a large bias and making the analysis very heterogeneous.



Thus, with the data obtained from the articles, it was possible to infer that the prevalence of TMD in patients with FM ranges from 13% to 87.1%, which makes us think to what extent these two conditions are related. The similarity in the behavior of these two conditions has been progressively the target of a growing number of studies indicating a greater involvement of the stomatognathic system in FM [12, 28-29].

FM is a chronic pain syndrome with complex multifactorial etiology, characterized by diffuse pain [4] as well as TMD [30], in addition, it is known that there is involvement of the central nervous system in these two conditions. However, although they share several symptoms, mainly pain, it is the patients with FM who suffer more because they present a neuronal dysregulation that causes them a hypersensitivity making them incapable to modulate the pain in front of painful stimuli when compared to patients com TMD [31].

Fundamentally, the differences in their pathophysiologies and the result of this neurochemical dysregulation will lead to symptoms of symptomatic allodynia, in which the patient reports pain to a stimulus that normally does not cause pain and hyperalgesia, where there is an exacerbation response to a small painful stimulus, besides painful discharges at different locations from where the stimulus was made [9].

Hedenberg-Magnusson B et al., [11] found an even greater number of TMD prevalence that was 94%, this percentage may be explained by the diagnostic method used, through a questionnaire that presents greater sensitivity, but less specificity. In addition, these same authors described that patients reported that stomatognathic system pain existed for over ten years, but overall pain in the body had a significantly longer duration than TMD. These findings suggest that FM precedes TMD, or that it initiates in other parts of the body and then extends to the temporomandibular region.

Pfau DB et al., [32] reported that there is a subgroup of patients with TMD similar to those with FM in pain sensitivity, but it is the patients with FM who describe more prolonged pain and poorer quality of life when compared to individuals with sensitive and insensitive TMD. Therefore, the most likely hypothesis appears to be that a set of FM symptoms may be responsible for the onset of TMD signs and symptoms. According to these same studies there seems to be a symptomatic and temporal correlation between these two conditions [33], the point is that they can act simultaneously or even precede each other. In addition, FM can often "erase" the existence of TMD and this in turn may contribute even more to worsening the quality of life of patients with FM, making the diagnosis of TMD essential.

The classification and diagnosis of TMDs is mainly based on the presence of signs and symptoms rather than on their etiology, since the understanding of their pathophysiological

mechanisms is still uncertain. In fact, clinically it is probably irrelevant to extend to the division of diagnostic subgroups if all dysfunctions within the same subgroup can be treated and controlled using similar therapies. Thus, specific inclusion and exclusion criteria for the diagnosis of these disorders are essential.

Currently, RDC / TMD is considered the best scientific evidence-based resource for the classification of TMD subgroups, allowing these criteria possible to be reproduced and measured scientifically [17]. However, there are a variety of protocols that are actually indexes of signs and symptoms [34-36] being used to diagnose TMDs, and this ends up generating disparity in the data, often leading to misleading results and hindering the interpretation by researchers and the community of health in general. Perhaps if the diagnostic standard were the same it would make it easier for other entities to use them, including in the rheumatologic area, specifically in fibromyalgia since these conditions share signs and symptoms can contribute in a negative way in the life of the patient. In addition, studies carried out with unreliable methodological criteria, presenting biases in several fundamental points for the clarification of specific questions have been well published, and this may end up generating a scientific misconception [29].

Other interesting results from this review concern the prevalence of TMD subtypes. It was possible to observe that painful TMDs (muscular and arthralgia) were the most prevalent in the studied patients. Especially Di Venere D et al., [14] reported that muscular-type TMD was present in 84% of FM patients

Much has been discussed about the role that muscles play in the etiology of FM, but there is not yet a consensus in this sense, besides being other factors also being the target of research [31, 37]. What is believed is that patients with FM are 31 times more likely to present a diagnosis of muscular orofacial pain than healthy individuals [38], that is, it is possible to conclude that FM can directly influence the painful diagnoses, especially on muscular TMDs.

Finally, because of the nature of the studies included in this review, it is not plausible to ensure that FM is an etiological factor for TMD. However, it can be a triggering factor and perpetuator of it. In addition, TMD may be only a clinical manifestation of fibromyalgia syndrome and not another specific pathology [28].

Thus, understanding, that there are a series of complexities in relation to the factors involved in FM and knowing that the prevalence of TMD in patients with fibromyalgia varies from 13% to 87.1% and that these signs and symptoms are not considered by the FM diagnostic criteria, careful evaluation by physicians and dental surgeons of the stomatognathic system is essential, since FM

can obscure those clinical aspects that, if properly treated, could improve the quality of life of these fibromyalgia patients.

## **6 LIMITATIONS**

Due to the design of the research and the nature of the studies to be cross-sectional, it was not possible to present temporal conclusions capable of identifying possible cause and effect relationships that could perhaps be found if longitudinal studies were included in the research. Thus, it is suggested to carry out longitudinal studies capable of proving or not the association between these two pathologies.

## **7 CONCLUSIONS**

The prevalence of TMD in patients with FM ranged from 13% to 87.1%. These data show that although the prevalence varies widely, the percentage of patients with these comorbidities can be high. Thus, it is essential that doctors and dentists are attentive to the signs and symptoms of these conditions given the negative interference they cause in the lives of patients.

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## **ETHICS COMMITTEE/INSTITUTE**

This study did not require the approval of the ethics committee.

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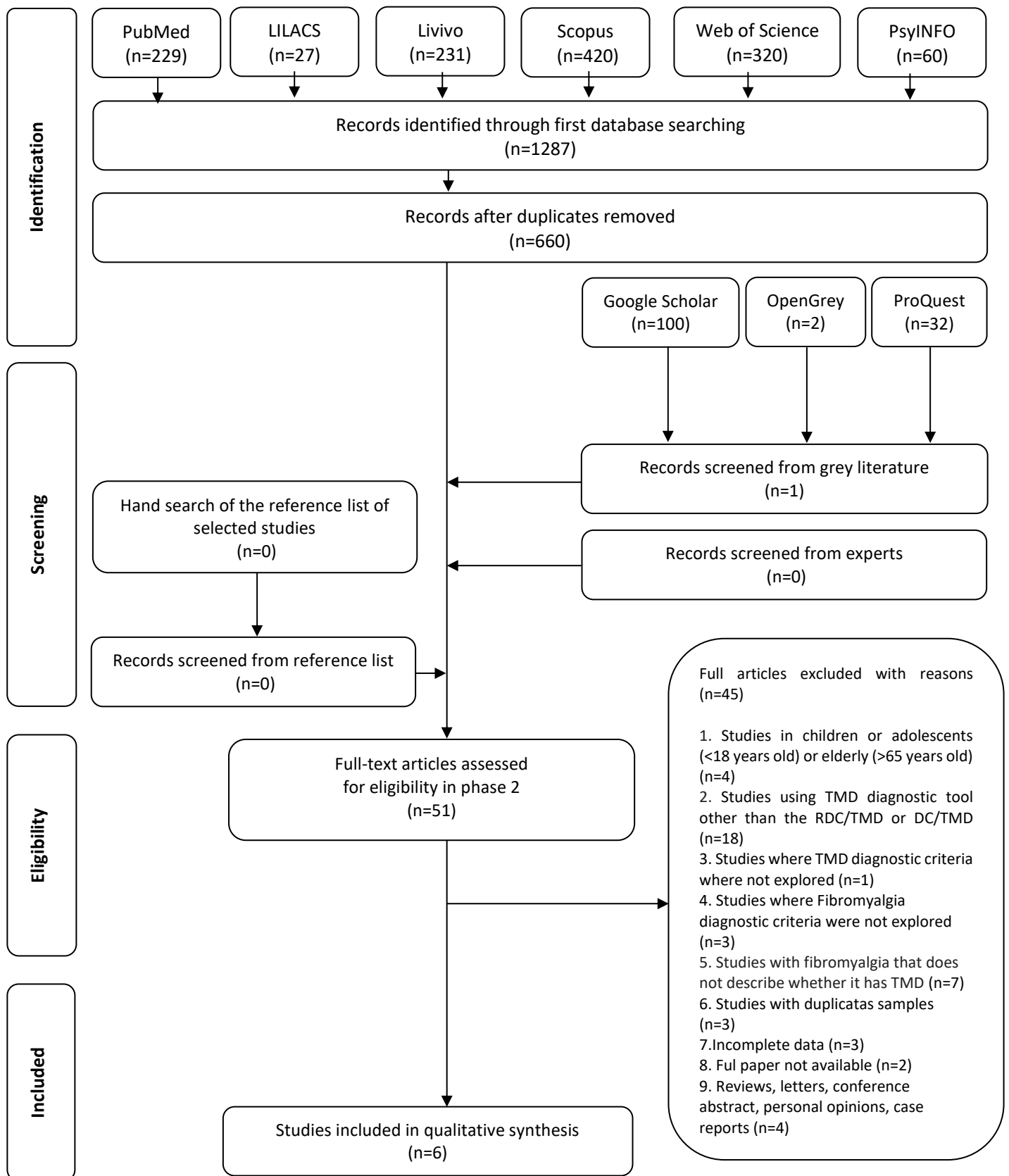
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Table/fig 2 - Summary of the characteristics of the included studies (n=6)

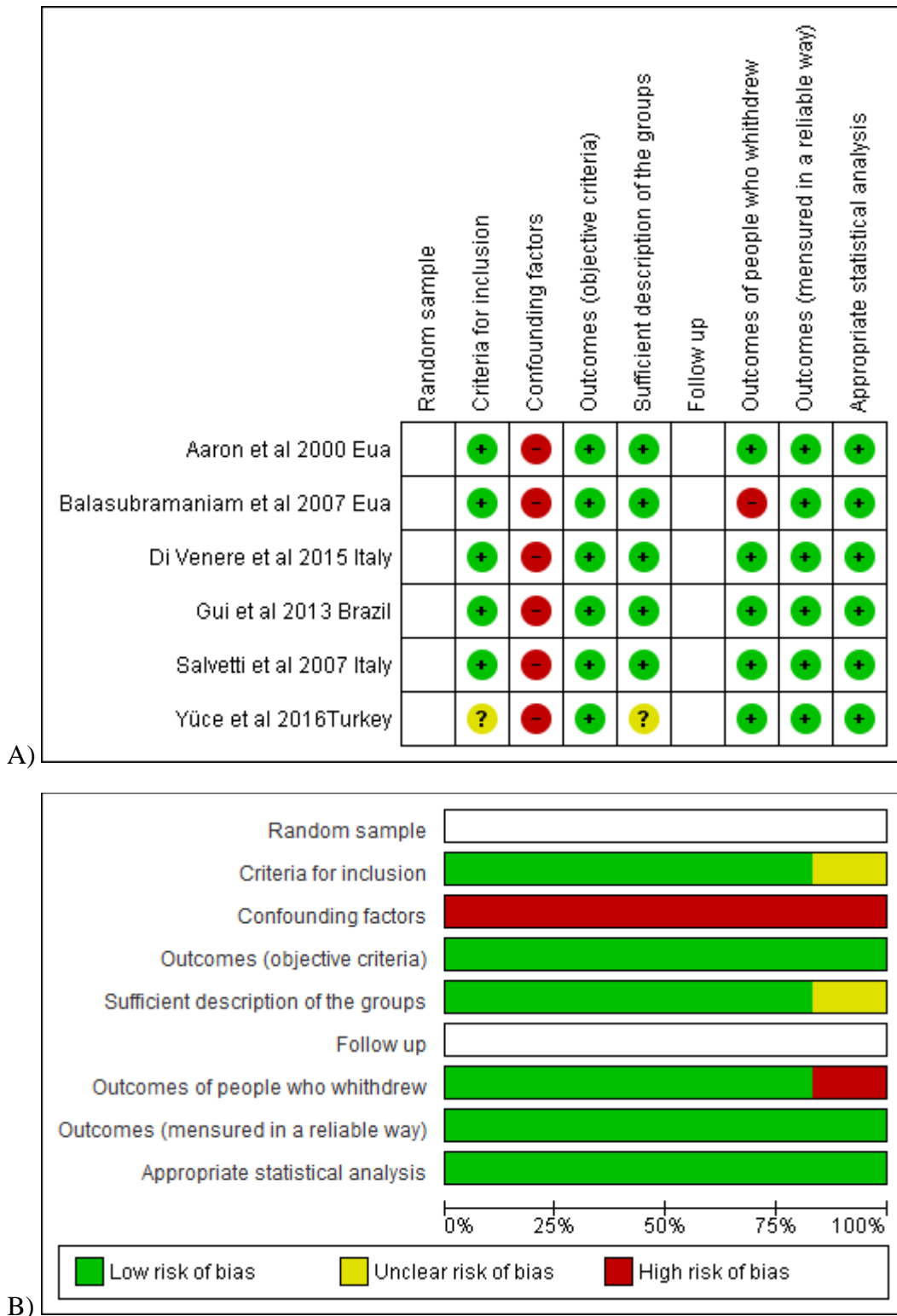
Author, Year, Country	Study type	Sample (N) genre	Age in years (range, mean $\pm$ SD)	Findings (N, %, OR, RR, correlations if provided)
Aaron et al., (2000) USA [23]	Cross-Sectional	FM (22) NA	FM (48.5) TMD (38.0)	Of the 22 FM 5 patients had TMD, this corresponds to 13%.
Balasubramaniam et al., (2007) USA [24]	Cross-Sectional	FM (32) F)	FM (52.2 $\pm$ 7.8)	53% of patients with FM reported face pain versus 11% of those without FM, and 59,3%* of FM patients met the criteria for TMD. Of those FM patients who did not report face pain, 47% fulfilled the clinical RDC for TMD criteria.
Di Venere et al., (2015) Italy [14]	Cross-Sectional	FM (31) 28F; 3M	FM (47.9 $\pm$ 9.9)	In 25 FM patients (80.6%) signs and symptoms of craniomandibular disorders (CMDs) were observed. In we reported the distribution of CMDs diagnosis according the RDC/TMD classification Summarizing, a muscular disorder is present in 21 patients (84%), a disc dislocation in 11 patients (44%), inflammatory and degenerative joint disorders in 3 patients (12%). In 40% of cases we have a combined diagnosis.
Gui et al., 2015 (Brazil) [8]	Cross-Sectional	FM (31) 31F	FM (53.2 $\pm$ 5.61)	Twenty-seven (87.1%) of these patients (FM group) participated in study: 22 patients with myofascial pain and 5 patients with myofascial pain with limited opening.
Salvetti et al., (2007) Italy [25]	Cross-Sectional	FM (93) 88F; 5M	FM (50.1 $\pm$ 9.8)	Seventy-four (79.6%) FM patients met criteria for at least one RDC/TMD diagnosis, with a prevalence of 40.9% (N=38) for muscle disorders, 29% (N=27) for disk displacement and 71% (N=66) for inflammatory-degenerative disorders.
Yüce et al., (2017) Turkey[26]	Cross-Sectional	FM(64) 64F	FM (43.89 $\pm$ 9.74)	The prevalence of TMD disorder was 31% and 19% in FM patients and controls, respectively.

Legend: CMD: craniomandibular disorders; FM: fibromyalgia; HV: healthy volunteers; TMD: temporomandibular disorder; RDC: diagnostic criteria research; F: female; M: male; N: number; NA: Not available; OR: odds ration; RR: relative risk; SD: standard deviation; \*: values calculated by the authors

Table/fig 1 - Flow Diagram of Literature Search and Selection Criteria.<sup>1</sup><sup>1</sup> Adapted from PRISMA.



Table/fig 3 - Risk of bias for cross-sectional studies, assessed by MASTARI.( Meta-Analysis of Statistics Assessment and Review Instrument). A) Risk of bias summary; (B) Risk of bias graph. Figures generated by RevMan 5.3.



## Appendix 1 - Data search strategy.

Database	Search query 2018, May, 15th, update in 2019, March 18th
LILACS	(tw:(("fibromyalgia" OR "Fibromyalgias" OR "Muscular Rheumatism" OR "Fibrositis" OR "fibromyalgic" OR "fibromyalgia syndrome" OR "rheumatic syndrome" OR "fibromialgia" OR "Síndrome fibromiálgica" OR "Fibromialgias" OR "Síndromes fibromiálgicas" OR "Fibrosite" OR "Fibrosites" OR "Reumatismo muscular" OR "Síndrom Reumática" OR "síndrome de fibromialgia" OR "fibrositis" OR "Síndrome Reumático" OR "reumatismo muscular" )) AND (tw:(("temporomandibular joint" OR "temporo mandibular joint" OR "temporomandibular disorder" OR "temporo mandibular disorder" OR "temporomandibular disorders" OR "temporo mandibular disorders" OR "Temporomandibular dysfunction" OR "Temporo mandibular dysfunction" OR "Temporomandibular dysfunctions" OR "Temporomandibular dysfunctions" OR "TMD" OR "TMJD" OR "TMJ" OR "craniomandibular disorders" OR "craniomandibular disorder" OR "Craniomandibular dysfunction" OR "Craniomandibular dysfunctions" OR "costen's syndrome" OR "myofacial pain dysfunction syndrome" OR "Articulação Temporomandibular" OR "Transtornos da Articulação Temporomandibular" OR "Transtornos Craniomandibulares" OR dtm OR temporomandibular* OR "temporo-mandibulares" OR "temporo-mandibular" OR "craniomandibulares" OR "cranio-mandibulares" OR "cranio-mandibular" OR "Articulación Temporomandibular" OR "Trastornos de la Articulación Temporomandibular" OR "Trastornos Craneomandibulares" OR craneomandibular* OR "craneo-mandibular" OR "craneo-mandibulares")))) AND (instance:"regional") AND (db:("LILACS")) AND (instance:"regional")
LIVIVO	("fibromyalgia" OR "Fibromyalgias" OR "Muscular Rheumatism" OR "Fibrositis" OR "fibromyalgic" OR "fibromyalgia syndrome" OR "rheumatic syndrome") AND ("temporomandibular joint" OR "temporo mandibular joint" OR "temporomandibular disorder" OR "temporo mandibular disorder" OR "temporomandibular disorders" OR "temporo mandibular disorders" OR "Temporomandibular dysfunction" OR "Temporo mandibular dysfunction" OR "Temporomandibular dysfunctions" OR "Temporomandibular dysfunctions" OR "TMD" OR "TMJD" OR "TMJ" OR "craniomandibular disorders" OR "craniomandibular disorder" OR "Craniomandibular dysfunction" OR "Craniomandibular dysfunctions" OR "costen's syndrome" OR "myofacial pain dysfunction syndrome")
PubMed	#1= ("fibromyalgia"[MeSH Terms] OR "fibromyalgia"[All Fields] OR "Fibromyalgias"[All Fields] OR "Muscular Rheumatism"[All Fields] OR "Fibrositis"[All Fields] OR "fibromyalgic"[All Fields]) OR "fibromyalgia syndrome" OR "rheumatic syndrome"  #2= ("temporomandibular joint disorders"[MeSH Terms] OR "temporomandibular joint"[MeSH Terms] OR "temporomandibular joint"[All Fields] OR "temporo mandibular joint"[All Fields] OR "temporomandibular disorder"[All Fields] OR "temporo mandibular disorder"[All Fields] OR "temporomandibular disorders"[All Fields] OR "temporo mandibular disorders"[All Fields] OR "Temporomandibular dysfunction"[All Fields] OR "Temporo mandibular dysfunction"[All Fields] OR "Temporomandibular dysfunctions"[All Fields] OR "Temporomandibular dysfunctions"[All Fields] OR "TMD"[All Fields] OR "TMJD"[All Fields] OR "TMJ"[All Fields] OR "craniomandibular disorders"[MeSH Terms] OR "craniomandibular disorders"[All Fields] OR "craniomandibular disorder"[All Fields] OR "Craniomandibular dysfunction"[All Fields] OR "Craniomandibular dysfunctions"[All Fields] OR "costen's syndrome"[All Fields] OR "myofacial pain dysfunction syndrome"[All Fields])
PsycINFO	#1= ("fibromyalgia" OR "Fibromyalgias" OR "Muscular Rheumatism" OR "Fibrositis" OR "fibromyalgic" OR "fibromyalgia syndrome" OR "rheumatic syndrome")

	#2= ("temporomandibular joint" OR "temporo mandibular joint" OR "temporomandibular disorder" OR "temporo mandibular disorder" OR "temporomandibular disorders" OR "temporo mandibular disorders" OR "Temporomandibular dysfunction" OR "Temporo mandibular dysfunction" OR "Temporomandibular dysfunctions" OR "Temporomandibular dysfunctions" OR "TMD" OR "TMJD" OR "TMJ" OR "craniomandibular disorders" OR "craniomandibular disorder" OR "Cranio mandibular dysfunction" OR "Cranio mandibular dysfunctions" OR "costen's syndrome" OR "myofacial pain dysfunction syndrome")
<b>SCOPUS</b>	TITLE-ABS-KEY("fibromyalgia" OR "Fibromyalgias" OR "Muscular Rheumatism" OR "fibromyalgia syndrome" OR "Fibrositis" OR "fibromyalgic" OR "rheumatic syndrome") AND TITLE-ABS-KEY("temporomandibular joint" OR "temporo mandibular joint" OR "temporomandibular disorder" OR "temporo mandibular disorder" OR "temporomandibular disorders" OR "temporo mandibular disorders" OR "Temporomandibular dysfunction" OR "Temporo mandibular dysfunction" OR "Temporomandibular dysfunctions" OR "Temporomandibular dysfunctions" OR "TMD" OR "TMJD" OR "TMJ" OR "craniomandibular disorders" OR "craniomandibular disorder" OR "Cranio mandibular dysfunction" OR "Cranio mandibular dysfunctions" OR "costen's syndrome" OR "myofacial pain dysfunction syndrome")
<b>Web of Science</b>	(TS=("fibromyalgia" OR "Fibromyalgias" OR "Muscular Rheumatism" OR "Fibrositis" OR "fibromyalgic" OR "fibromyalgia syndrome" OR "rheumatic syndrome") AND TS=("temporomandibular joint" OR "temporo mandibular joint" OR "temporomandibular disorder" OR "temporo mandibular disorder" OR "temporomandibular disorders" OR "temporo mandibular disorders" OR "Temporomandibular dysfunction" OR "Temporo mandibular dysfunction" OR "Temporomandibular dysfunctions" OR "Temporomandibular dysfunctions" OR "TMD" OR "TMJD" OR "TMJ" OR "craniomandibular disorders" OR "craniomandibular disorder" OR "Cranio mandibular dysfunction" OR "Cranio mandibular dysfunctions" OR "costen's syndrome" OR "myofacial pain dysfunction syndrome")) AND DOCUMENT TYPES: (Article)
<b>Grey Literature</b>	
<b>Google Scholar</b>	fibromyalgia AND ("temporomandibular joint" OR "temporomandibular disorder" OR TMD)
<b>Open Grey</b>	("fibromyalgia" OR "Fibromyalgias" OR "Muscular Rheumatism" OR "Fibrositis" OR "fibromyalgic" OR "fibromyalgia syndrome" OR "rheumatic syndrome") AND ("temporomandibular joint" OR "temporo mandibular joint" OR "temporomandibular disorder" OR "temporo mandibular disorder" OR "temporomandibular disorders" OR "temporo mandibular disorders" OR "Temporomandibular dysfunction" OR "Temporo mandibular dysfunction" OR "Temporomandibular dysfunctions" OR "Temporomandibular dysfunctions" OR "TMD" OR "TMJD" OR "TMJ" OR "craniomandibular disorders" OR "craniomandibular disorder" OR "Cranio mandibular dysfunction" OR "Cranio mandibular dysfunctions" OR "costen's syndrome" OR "myofacial pain dysfunction syndrome")
<b>Proquest</b>	all("fibromyalgia" OR "Fibromyalgias" OR "Muscular Rheumatism" OR "Fibrositis" OR "fibromyalgic" OR "fibromyalgia syndrome" OR "rheumatic syndrome") AND all("temporomandibular joint" OR "temporo mandibular joint" OR "temporomandibular disorder" OR "temporo mandibular disorder" OR "temporomandibular disorders" OR "temporo mandibular disorders" OR "Temporomandibular dysfunction" OR "Temporo mandibular dysfunction" OR "Temporomandibular dysfunctions" OR "Temporomandibular dysfunctions" OR "TMD" OR "TMJD" OR "TMJ" OR "craniomandibular disorders" OR "craniomandibular disorder" OR "Cranio mandibular dysfunction" OR "Cranio mandibular dysfunctions" OR "costen's syndrome" OR "myofacial pain dysfunction syndrome")

## Appendix 2 - Excluded articles and reasons for exclusion (n=45).

<b>Author, Year</b>	<b>Reason for exclusion</b>
de Siqueira SR et al., (2013) [1]	2
Silva LAD et al., (2012) [2]	2
García-Moya EJ et al., (2015) [3]	2
Leblebici B et al., (2007) [4]	2
Lim PF et al., (2010) [5]	4
Thorp JN et al., (2011) [6]	2
Hebenberg-Magnusson B et al., (1999) [7]	2
Gómez-Argüelles JM et al., (2009) [8]	3
Andrade SC et al., (2016) [9]	5
Nes LS et al., (2010) [10]	2
Pjau DB et al., (2009) [11]	2
Hebenberg-Magnusson B et al., 1997 [12]	2
Hoffman RG et al., (2011) [13]	2
Velly AM et al., (2010) [14]	5
John MT et al., (2003) [15]	2
Sollecito TP et al., (2003) [16]	9
Gist AC et al., (2017) [17]	2
Alonso-Blanco C et al., (2012) [18]	5
Brill S et al., (2012) [19]	5
Howard KJ et al., (2010) [20]	5
Karibe H et al., (2011) [21]	5
Klasser GD et al., (2014) [22]	4
Korszun A et al., (1998) [23]	2
Olama SM et al., (2013) [24]	1
Oono Y et al., (2014) [25]	4
Yunus MB (2012) [26]	9
de Siqueira JT et al., (2004) [27]	2
Yim YR et al., (2016) [28]	2
Van Damme S et al., (2018) [29]	2
Rhodus NL et al., (2003) [30]	2
Patris ML et al., (2013) [31]	8
Pearce J (2004) [32]	9

Pimentel MJ et al., (2015) [33]	6
Leitão GL et al., (2014) [34]	2
Fraga BP et al., (2012) [35]	7
Losert-Bruggner B (2017) [36]	1
Janal KG et al., (2016) [37]	5
Corsalini M et al., (2017) [38]	6
Fujarra FJ et al., (2015) [39]	1
Pimentel MJ et al., (2013) [40]	6
Dao TT (1997) [41]	7
Manfredini D et al., (2004) [42]	6
Ayouni I et al., 2019 [43]	9
Murayama RA 2009 [44]	7
Plesh O et al., (1996) [45]	8

Legend – 1) Studies in children or adolescents (<18 years old) or elderly (>65 years old); 2) Studies using TMD diagnostic tool other than the RDC/TMD or DC/TMD; 3) Studies where TMD diagnostic criteria were not explored; 4) Studies where Fibromyalgia diagnostic criteria were not explored; 5) Studies with fibromyalgia that does not describe whether it has TMD; 6) Studies with duplicated samples 7) Incomplete data 8) Full paper not available 9) Reviews, letters, conference abstract, personal opinions, case reports;

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Appendix 3 - Results from Joanna Briggs Institute Critical Appraisal Checklist for Descriptive Studies.

Author, year	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Total	Risk of Bias
<b>Aaron et al., 2000, Eua</b>	NA	Y	N	Y	Y	NA	Y	Y	Y	85,7%	LOW
<b>Balasubramaniam et al., 2007, Eua</b>	NA	Y	N	Y	Y	NA	N	Y	Y	71,4%	LOW
<b>Di Venere et al., 2015, Italy</b>	NA	Y	N	Y	Y	NA	Y	Y	Y	85,7%	LOW
<b>Gui et al., 2013, Brazil</b>	NA	Y	N	Y	Y	NA	Y	Y	Y	85,7%	LOW
<b>Salveti et al., 2007, Italy</b>	NA	Y	N	Y	Y	NA	Y	Y	Y	85,7%	LOW
<b>Yüce et al., 2016; Turkey</b>	NA	U	N	Y	U	NA	Y	Y	Y	57,1%	MODERATE

Legend: Y= Yes; N= No; U= Unclear; NA= Not applicable

Q1 - Was study based on a random or pseudo-random sample?

Q2- Were the criteria for inclusion in the sample clearly defined?

Q3- Were confounding factors identified and strategies to deal with them stated?

Q4- Were outcomes assessed using objective criteria?

Q5- If comparisons are being made, was there a sufficient description of the groups?

Q6- Was follow up carried out over a sufficient time period?

Q7- Were the outcomes of people who withdrew described and included in the analysis?

Q8- Were outcomes measured in a reliable way?

Q9- Was appropriate statistical analysis used?

Total=  $\Sigma Y$ /Applicable Items (the Not Applicable (NA) items were excluded from the sum).

Risk of bias was categorized as high when the study reaches up to 49% score “yes”, moderate when the study reached 50% to 69% score “yes”, and low when the study reached more than 70% score “yes”.