

Association Between Orofacial Pain and Anxiety: A Systematic Review

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Abstract: The prevalence of orofacial pain continues to increase. Additionally, the rising number has been accompanied by reduced quality of life of its sufferers. An assumed association between orofacial pain and anxiety has surfaced due to the results of several studies that show higher occurrence of anxiety in people experiencing orofacial pain, compared to those who are orofacial-pain-free. The aim of this systematic review was to discover past research on orofacial pain and its relationship to anxiety, and to understand the relationship between acute and chronic orofacial pain and anxiety. The current systematic review was conducted according to the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) rules. Study searches were carried out using three databases, namely PubMed, ScienceDirect, and Scopus. Article selection was carried out in several stages and was based on inclusion and exclusion criteria and continued by assessing the methodological quality and risk of bias of each article. The risk of bias was analyzed by using the critical review tool for cross-sectional studies from the Joanna Briggs Institute (JBI). The selection process led to a review process of 13 cross-sectional research articles. The systematic review showed a positive relationship between orofacial pain and anxiety, with variations in the strength of the relationship (weak to moderate). Most articles revealed that anxiety is a risk factor for orofacial pain. A correlation between chronic orofacial pain and anxiety was mentioned in several studies. It can be concluded that there is an existing relationship between orofacial pain and anxiety, especially chronic orofacial pain. Prospero registration number: CRD42023385409

Keywords: chronic orofacial pain, acute orofacial pain, psychological factors, correlation, risk factor

Introduction

Orofacial pain is a term to describe pain in the oral, face, and neck areas.^{1,2} It may affect various structures in the orofacial region such as the dentoalveolar structure, the temporomandibular joint (TMJ), the myofascial structures, or may also involve the innervations around the area.³ A study by Rikmasari et al in 2018 revealed that this condition had a prevalence of 52.62% in 534 individuals aged 31–45 years old in West Java, Indonesia.¹ Another epidemiology study by Häggman-Henrikson on 180,308 individuals in Switzerland revealed that orofacial pain is more common in females and has a rising prevalence within eight years of observation.⁴ It has been acknowledged how orofacial pain burdens patients with substantial negative effects, directly affecting their quality of life.⁵ Orofacial pain potentially brings functional limitations, psychological inconvenience, and disability.^{6,7} Oral pain, a part of orofacial pain, is reported to make an individual 12 times more likely to have an unproductive day compared to individuals without the condition.⁷

The heavy burden of orofacial pain and its rising incidence show the need for a thorough understanding of the condition and its treatment. However, orofacial pain is mostly understood through its relationship with somatic and neuropathic factors. Psychological factors, on the other hand, have not been thoroughly understood nor how they correlate with orofacial pain.⁸ An assumed correlation has surfaced due to the results of several studies that show higher occurrence of psychological disorders, like anxiety, in people experiencing orofacial pain compared to those who are orofacial-pain-free.^{1,2}

Anxiety is a frequent psychological condition with a high global prevalence.⁹ The prevalence has been rising; one reason is the global COVID-19 pandemic that has had a huge impact on the psychological state of people all around the world.^{10,11} The Global Burden of Diseases, Injuries, and Risk Factors Study stated that anxiety is one of the most disabling psychological disorders.¹¹ These facts add to the burden that orofacial pain brings for its sufferers if its association with anxiety is established. The negative impacts on quality of life of people experiencing orofacial pain with an association with anxiety brings an urgency to the understanding of their relationship.

The association between orofacial pain and anxiety has been evaluated in several studies, but it has not been systematically mapped to help understand the correlation between these two factors. Which bring us to the questions: (1) Does the lingering pain of orofacial pain cause anxiety that then might cause even more orofacial pain? or (2) Could anxiety be the cause of orofacial pain? Additionally, it has also not been well understood whether anxiety has a greater tendency to occur in acute orofacial pain where the higher pain intensity may have a greater psychological impact on the patient, or in chronic orofacial pain where psychological distress happens because of the prolonged orofacial pain duration. Therefore, the aims of this review were to systematically review previous studies on orofacial pain to evaluate its association with anxiety and to understand the correlation between acute and chronic orofacial pain and anxiety.

Methods

Protocol and Registration

This systematic review was designed and conducted in accordance to the Preferred Reported Items for Systematic Reviews and Meta-Analyses (PRISMA) guideline and has been recorded in the International Prospective Register of Systematic Reviews (PROSPERO) with the following registration number: ID CRD42023385409.

Selection of Studies and Eligibility Criteria

Studies were included in this review if they met the following criteria: (1) articles on orofacial pain where the involvement of anxiety is mentioned, (2) studies were conducted on human, (3) pain duration was mentioned, (4) quantification scales were used to measure reported orofacial pain and anxiety, (5) statistical analysis used to analyze the association between the orofacial pain and anxiety scale was clearly mentioned, (6) published between 2012 and 2022, (7) was conducted by cross-sectional study design, and (8) published in English where full-text article is accessible. Systematic reviews and meta-analysis articles were excluded.

Information Sources and Search Strategy

Three databases (ScienceDirect, PubMed, Scopus) were used in the initial search stage by using the following keywords: (“acute” OR “chronic”) AND “orofacial pain” AND (“prevalence” OR “incidence”) AND “anxiety” AND (“association” OR “relationship”). Articles that were considered as eligible were further assessed for risks of bias.

Risk of Bias Assessment

Risk of bias was assessed using Joanna Briggs Institute (JBI) critical appraisal tools for analytical cross-sectional studies. Full-text manuscript of the final selected studies were appraised by eight questions regarding the clarity of the inclusion criteria, study subjects, and settings, exposure measurements, confounding factors, outcome measurements, and statistical analysis in the study. Assessment was performed independently by two reviewers and was merged by consensus. Any disagreements that might arise upon discussion would be resolved by the third assessor on this study.

Data Extraction and Data Analysis

The following data were extracted from selected studies: (1) article information (author, year of publication, type of study, country), (2) type of orofacial pain, (3) sample characteristics (sample size, age), (4) orofacial pain duration, (5) orofacial pain scale, (6) anxiety scale, (7) statistical analysis, and (8) result of the study. Extracted data were recorded in a tabular form and qualitatively analyzed. Qualitative analyses were also performed on articles evaluating the association between acute and chronic orofacial pain with anxiety.

Results

Study Selection

A total of 2975 studies were obtained from the initial search on all databases. Study selection was conducted in accordance to the PRISMA 2020 flow diagram as shown in Figure 1.¹² Studies were then screened for duplications and eligibility. Most of study elimination was due to ineligibility of study based on the inclusion criteria. Several studies were eliminated due to inappropriate statistical analysis. Screening and elimination resulted in the inclusion of 13 cross-sectional studies.

Assessment of Risk of Bias

Result of risk of bias assessment is shown in Table 1.¹³ Result of the JBI critical appraisal tool divides studies into three categories. Those with a JBI score higher than 70% are categorized as high-quality studies. Moderate quality studies consist of studies with a JBI score between 50% and 70%, while studies with JBI score lower than 50% are classified as having a low quality. All 13 studies in this review attained over 70% of the JBI score, and were therefore classified as high-quality studies.

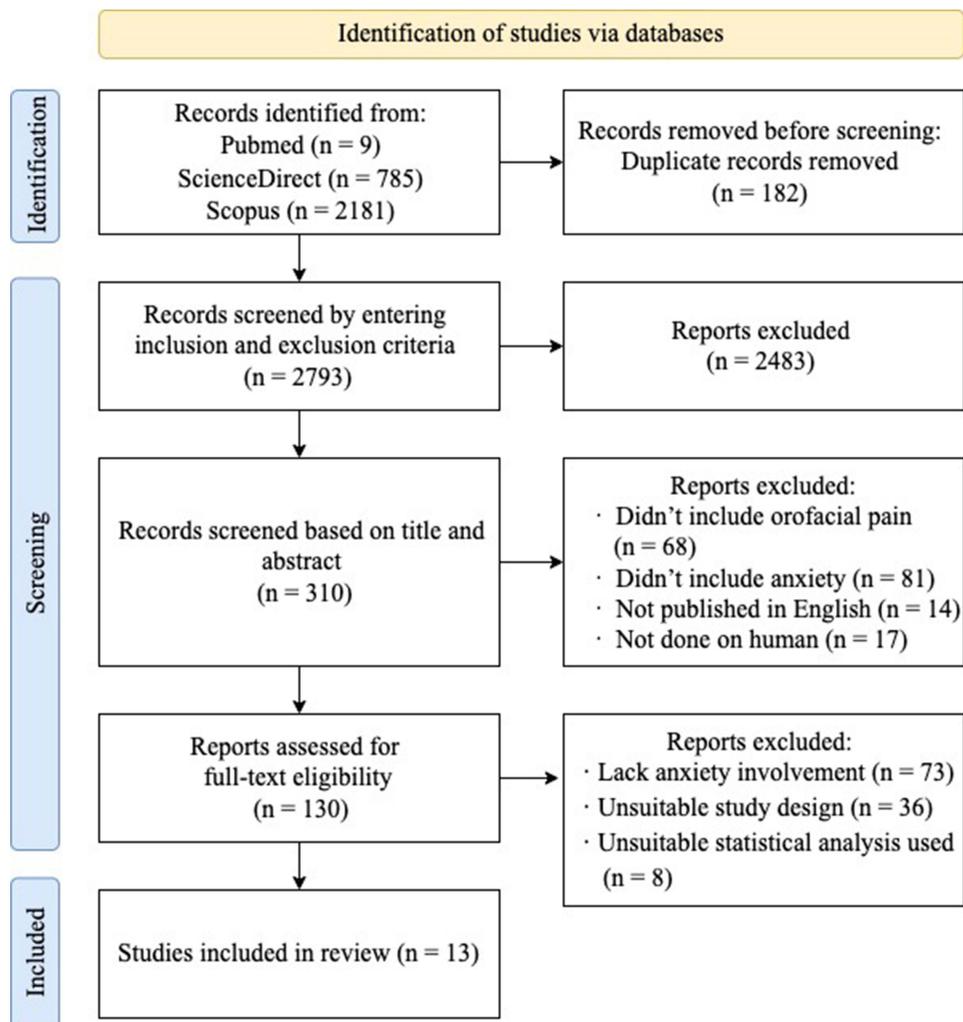


Figure 1 Selection of studies conducted in accordance to the PRISMA guideline resulted in the obtainment of thirteen studies.

Notes: PRISMA figure adapted from Page MJ, McKenzie JE, Bossuyt PM, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ*. Published online March 29, 2021:n71.¹²

Table 1 Risk of Bias Assessment with the JBI Critical Appraisal Tool Showed the Inclusion of High-Quality Studies

JBI Critical Appraisal	Bhalang et al ¹⁴ 2020	Kumar S. et al ¹⁵ 2022	Lee and Auh ¹⁶ 2022	Greenberg et al ¹⁷ 2022	Wu et al ¹⁸ 2021	Ye et al ¹⁹ 2022	Chuinsiri and Jitprasertwong ²⁰ 2020	Owczarek et al ²¹ 2020	Badel et al ²² 2019	Lages et al ²³ 2020	Bäck et al ²⁴ 2019	Honda et al ²⁵ 2018	Su et al ²⁶ 2016
Were the criteria for inclusion in the sample clearly defined?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Were the study subjects and the setting described in detail?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Was the exposure measured in a valid and reliable way?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Were objective, standard criteria used for measurement of the condition?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Were confounding factors identified?	Yes	No	Yes	Yes	Yes	Yes	Unclear	No	No	No	Yes	Yes	Yes
Were strategies to deal with confounding factors stated?	Yes	No	Yes	Yes	Yes	Yes	Unclear	No	No	No	Yes	Yes	Yes
Were the outcomes measured in a valid and reliable way?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Was appropriate statistical analysis used?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Result	100%	75%	100%	100%	100%	100%	75%	75%	75%	75%	100%	100%	100%

Notes: JBI Checklist used with permission from The University of Adelaide. Moola S, Munn Z, Tufanaru C, Aromataris E, Sears K, Sfetcu R, Currie M, Qureshi R, Mattis P, Lisy K, Mu P-F. Chapter 7: Systematic reviews of etiology and risk. In: Aromataris E, Munn Z (Editors). JBI Manual for Evidence Synthesis. JBI, 2020. Available from <https://synthesismanual.jbi.global>.¹³

Results of Individual Studies

Thirteen cross-sectional studies were included in this review. Extracted data are presented in Table 2. All studies included in this review were published within 2016–2022. Five of the studies reported the condition of orofacial pain in general, and the other eight focused specifically on temporomandibular disorders (TMD). A study on patients with orofacial pain

Table 2 Extracted Data from the Obtained Studies Show the Various Orofacial Pain and Anxiety Scales Used and Study Results

Article Information (Author/Year/Country)	Orofacial Pain Classification	Sample Characteristics		Orofacial Pain Duration	Orofacial Pain Scale	Anxiety Scale	Statistical Analysis	Study Result
		Sample Size	Age					
Bhalang et al ¹⁴ / 2020 / Switzerland	Various types of orofacial pain	799	73.6% 20–59 years old	84.4% chronic 15.5% acute	NRS	GAD-7	$r=0.22$	Insignificant correlation
Kumar et al ¹⁵ / 2022 / India	TMD	384	18–28 years	N/A	Self-administered anamnestic questionnaire (Fonseca et al)	HADS	$r=0.261$ $P<0.001$	Significant positive correlation
Lee and Auh ¹⁶ / 2022 / South Korea	TMD	112	Mean 35.9 ± 17.6 years	Chronic	VAS	BAI	Myalgia patients before COVID-19 $r=0.20$ Myalgia patients after COVID-19 $r=0.31$ Arthralgia patients before COVID-19 $r=0.07$ Arthralgia patients after COVID-19 $r=0.32$ Mixed TMD patients before COVID-19 $r=-0.12$ Mixed TMD patients after COVID-19 $r=0.62$	Significant positive correlation
Greenberg et al ¹⁷ / 2022 / United States	Chronic orofacial pain (diagnosis varies)	303	Mean 59.11 ± 27.57 years	Chronic	GCPS	PROMIS anxiety scale version 108a	$r=0.287$ $P<0.01$	Significant positive correlation
Wu et al ¹⁸ / 2021 / China	TMD	754	18–19 years	N/A	DC/TMD symptom questionnaire	GAD-7	$r=0.355$	Significant positive correlation
Chengxinyue Ye et al ¹⁹ / 2022 / China	TMD	570	Mean 24.44 ± 8.29 years	N/A	DC/TMD symptom questionnaire	GAD-7	Pain-related TMD $r=0.121$ $P<0.05$ Intra-articular TMD $r=0.171$ $P<0.05$ OR 2.196	Significant positive correlation

(Continued)

Table 2 (Continued).

Article Information (Author/Year/Country)	Orofacial Pain Classification	Sample Characteristics		Orofacial Pain Duration	Orofacial Pain Scale	Anxiety Scale	Statistical Analysis	Study Result
		Sample Size	Age					
Chuinsiri and Jitprasertwong ²⁰ / 2020 / Thailand	TMD	221	Mean 43.4 ± 14.9 years	N/A	TMD pain screener	GAD-2	r=0.367 P<0.01	Significant positive correlation
Owczarek et al ²¹ / 2020 / Poland	TMD	105	Mean 20.2 ± 1.1 years	N/A	DC/TMD assessment instruments	HADS	r=0.23 P<0.093	Positive correlation
Badel et al ²² / 2019 / Croatia	Various types of orofacial pain	470	Mean 42.32 ± 17.72 years	N/A	VAS	STAI	STAI 1 t-test 8.5927 P<0.0001 STAI 2 t-test 9.5607 P<0.0001	Significant correlation
de Deus Lages et al ²³ / 2020 / Brazil	TMD	83	Mean 25.16 ± 4.40 years	N/A	VAS	STAI	STAI-T r=0.53 P<0.0001 STAI-S r=0.50 P<0.0001	Significant positive correlation
Bäck et al ²⁴ / 2019 / Sweden	Various types of orofacial pain	1059	43.8% 38 years old 56.18% 50 years old	77% chronic 23% acute	NRS	HADS	r=0.19 P=0.75 OR 1.1	Insignificant correlation
Honda et al ²⁵ / 2018 / Japan	Chronic and acute orofacial pain (diagnosis varies)	854	Mean 44.5 ± 15.7 years (acute patients) Mean 51.0 ± 15.3 years (chronic patients)	43.2% acute 56.79% chronic	VAS	STAI, HADS	A-Trait P=0.008 A-State P=0.446 HADS-A P=0.006	Anxiety significantly higher in chronic pain group
Su et al ²⁶ / 2016 / Netherlands	TMD	320	Mean 43.2 ± 14.6 years	Chronic	CPI	GAD-7	OR mild anxiety – CPI 1.016 OR moderate anxiety – CPI 2.265 OR severe anxiety – CPI 5.578 P=0.004	Significant association

Abbreviations: TMD, temporomandibular disorder; NRS, numeric rating scale; VAS, visual analog scale; GCPS, graded chronic pain scale; CPI, characteristic pain intensity; GAD-7, generalized anxiety disorder scale-7; HADS, hospital anxiety and depression scale; BAI, Beck anxiety inventory; GAD-2, generalized anxiety disorder scale-2; STAI, state-trait anxiety inventory; OR, odds ratio.

reported four different subgroups, including temporomandibular joint (TMJ) diagnosis, myofascial pain, trigeminal neuralgia, and maxillofacial pathology.²² Another orofacial pain study also included patients with TMD, neuropathic pain, glossodynia, odontogenic pain, and other types of orofacial pain.²⁵

Pain duration varies among studies. Most studies include patients with different ranges of duration of pain. Only three articles study chronic orofacial pain.^{16,17,26} Various pain and anxiety scale measurements were used. Four studies used

visual analog scale (VAS).^{16,22,23,25} Numeric rating scale (NRS), graded chronic pain scale (GCPS), characteristic pain intensity (CPI), and a Fonseca Anamnestic Index were used in the rest of the studies.^{14,15,17,24,26} Four studies did not include any pain scale but assessed TMD symptoms and pain with questionnaires and clinical examinations instead.^{18–21} Anxiety measurement scales used are generalized anxiety disorder scale-7 (GAD-7), generalized anxiety disorder scale-2 (GAD-2), hospital anxiety and depression scale (HADS), Beck anxiety inventory (BAI), and state-trait anxiety inventory (STAI).

Ten studies used the Spearman's rank correlation coefficient to analyze the correlation between orofacial pain and anxiety.^{14–21,23,24} Interestingly, no study reported high correlation between orofacial pain and anxiety. Four studies reported a moderate correlation between orofacial pain and anxiety.^{16,18,20,23} All of these studies indicated significant positive moderate correlation between TMD and anxiety; one study found moderate correlation specifically with chronic mixed TMD pain assessed during the COVID-19 pandemic.¹⁶ Low correlations were found in five studies. Four of them indicated significant positive low correlation between TMD and anxiety.^{15,16,19,21} One study in the US reported significant positive low correlation between chronic orofacial pain and anxiety.¹⁷ The diagnosis of chronic orofacial pain being included in that study includes trigeminal neuralgia (51.5%), other neuropathic diagnoses (14.6%), persistent idiopathic orofacial pain (5.3%), and other diagnoses. Two studies reported insignificant positive correlation with low correlation value between orofacial pain and anxiety. Both studies were the ones that includes various diagnosis of orofacial pain, and the same pain scale (NRS) was used in these studies.^{14,24}

Three other studies used different statistical analysis to evaluate the association between orofacial pain and anxiety. One study used *t*-test to evaluate the association between orofacial pain and anxiety.²² This study reported a statistically significant correlation between anxiety and orofacial pain. One study assessed the significant association between orofacial pain and anxiety and their association with pain duration,²⁵ of which anxiety was significantly higher in the chronic pain group. The last study also evaluated significant association between TMD and anxiety²⁶ and reported an odds ratio (OR) of 1.02 (95% CI 0.58–1.77) between TMD pain and mild anxiety, an OR of 2.27 (95% CI 1.12–4.59) between TMD and moderate anxiety, and an OR of 5.58 (95% CI 1.82–17.03) between TMD and severe anxiety, indicating the increased likelihood of TMD in someone with higher anxiety level.

Discussion

To the best of our knowledge, this is the first systematic review to understand the association between orofacial pain and anxiety. A possible association between orofacial pain and anxiety might exist through two different routes. The first one is when lingering orofacial pain gives an individual an inconvenient and negative feeling through an extended time period, triggering psychological problems that might lead to anxiety.²⁷ On the other hand, there is a possibility that anxiety can act as a risk factor of orofacial pain. Emotional disturbance in an individual with anxiety may stimulate muscle stiffness and parafunctional habits, leading to orofacial pain.^{28,29}

The plausible associations between orofacial pain and anxiety are reflected in the findings of this systematic review. Among 13 studies, 11 studies reported significant association between orofacial pain and anxiety. All studies that used a correlation analysis showed a positive correlation between orofacial pain and anxiety. A positive correlation indicates that when one variable increases the other variable will also be increased, and it is indicated that an increase in orofacial pain was also accompanied by the increase of anxiety degree.³⁰

This systematic review also revealed that orofacial pain patients showed low to moderate correlation with anxiety. A similar level of correlation was found in a systematic review and meta-analysis studying the correlation between anxiety and pain in osteoarthritis patients.³¹ The current systematic review showed that studies with patients with various types of orofacial pain (ie myofascial pain, trigeminal neuralgia, odontogenic pain, etc.) reported low correlation between orofacial pain and anxiety.^{14,17,24} It was also revealed that moderate correlation with anxiety was only reported in articles studying one type of orofacial pain, specifically temporomandibular disorder (TMD). The intensity of association between TMD and anxiety was also shown in studies presenting an odds ratio between the two variables.

Studies presenting an odds ratio in this systematic review showed that individuals with higher degree of anxiety are at a higher risk of developing orofacial pain.^{19,26} Studies reported how anxiety was more common in patients with TMD than in those without TMD and that anxiety is an independent risk factor for TMD.^{18,20} Anxiety as a risk factor for

orofacial pain was also mentioned in some articles being reviewed in this systematic review.^{19,26} This theory is in line with a previous study stating anxiety being a risk factor for pain by increasing the odds of an individual to experience a disabling and limiting pain.³² A probable mechanism for this is that anxiety as psychological pressure stimulates a hormonal response that might lead to parafunctional habits, such as clenching and grinding.^{1,18,29} Injury to the structures related to the orofacial region may cause disorders that inflict orofacial pain.^{33,34} Anxiety has also been reported to elevate cytokines level, which would be related to pain by its ability to promote inflammatory response and leading to pain symptoms.³² Several studies suggested that anxiety is thought to have a pain catastrophizing effect, where a study on chronic musculoskeletal pain revealed that higher anxiety level was associated to higher pain sensitivity.³⁵

Exposure to pain that might enhance an individual's anxious state was also reported in this systematic review.²³ This postulation is supported by previous studies stating that pain intensity affects an individual towards a pain-related anxiety.³⁶ This might be due to the fact that the constant increase in cortisol levels during tissue injury in the orofacial region could potentially trigger psychological problems like anxiety.²⁷ A previous study on anxiety reported how dysregulation in the hypothalamus-pituitary-adrenal (HPA) endocrine axis, responsible for the secretion of cortisol, was found in individuals with anxiety.³⁷

This systematic review also attempted to reveal any differences in the association of anxiety to acute and chronic orofacial pain. However, a conclusion could not be drawn since most articles did not specify the pain duration of the patients being studied. Three articles that did specify the pain duration reported a significant association between chronic orofacial pain and anxiety.^{16,17,26} This particular finding was supported by previous studies about chronic pain. The association between chronic pain and anxiety might occur due to the constant negative feeling of being in pain that affects the body.²⁷ One article reviewed in this study evaluated the comparison of risk factors in patients with acute and chronic orofacial pain. This study result was in line with the other studies as it revealed that anxiety was found to be significantly higher in the chronic pain group.²⁵ Yet, due to the limited number of studies in the current systematic review, further studies that analyze the possible difference of acute and chronic orofacial pain to anxiety is of importance.

While orofacial pain is still the main reason for most dental visits and supposedly has been managed appropriately, leading to a decrease in prevalence, the prevalence rate is unfortunately, still increasing.⁴ This shows the lack of comprehensiveness in orofacial pain management. The findings of this review should be used as a reference in the management of orofacial pain, knowing that orofacial pain could be linked to anxiety. In a previous study about one of the most common sources of orofacial pain, temporomandibular disorders (TMD), it was concluded that in an effort to control TMD symptoms there is a need to do an assessment of the psychosocial aspects as well.³⁸ In relation to the result of this study, should anxiety be found in orofacial pain patients, then the orofacial pain specialist should include anxiety management in their treatment plan in order to obtain a more successful treatment outcome.

Conclusion

To conclude, this systematic review revealed that orofacial pain and anxiety are associated in a positive correlation with low to moderate strength. The analysis of this systematic review also suggested anxiety as a risk factor of orofacial pain. Several articles mentioned association between chronic orofacial pain and anxiety. This finding indicates the importance of future studies to evaluate the difference in association between acute and chronic orofacial pain to anxiety. Results of future studies are expected to be used as references in the management of orofacial pain accompanied by psychological factors.

Disclosure

The authors report no conflicts of interest in this work.

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