

CANNABIDIOL IN THE MANAGEMENT OF PAIN ASSOCIATED WITH TEMPOROMANDIBULAR DISORDERS

CANABIDIOL NO MANEJO DA DOR ASSOCIADA À DISFUNÇÃO TEMPOROMANDIBULAR

CANNABIDIOL EN EL TRATAMIENTO DEL DOLOR ASOCIADO CON LA DISFUNCIÓN TEMPOROMANDIBULAR



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ABSTRACT

Temporomandibular disorder (TMD) comprises a group of conditions affecting the temporomandibular joint and associated structures, representing one of the main causes of non-odontogenic orofacial pain. Given the limitations of conventional therapeutic approaches, cannabidiol (CBD) has emerged as a potential alternative for pain management due to its analgesic, anti-inflammatory, and endocannabinoid system-modulating properties. This study aimed to critically analyze the scientific evidence regarding the use of cannabidiol in the management of pain associated with TMD. This is a narrative literature review with a qualitative approach, conducted in the PubMed, SciELO, and ScienceDirect databases, including publications from 2015 to 2025. Clinical studies, reviews, and experimental research addressing the use of CBD in orofacial pain, myofascial pain, or TMD were included. The findings revealed a predominance of indirect evidence, including reviews and experimental models, with a limited number of randomized clinical trials. Two recent clinical studies demonstrated significant reductions in pain and muscle activity in TMD patients treated with cannabidiol. Additionally, preclinical evidence supports the analgesic and anti-inflammatory effects of CBD, reinforcing its biological plausibility. However, methodological heterogeneity and the scarcity of robust clinical evidence limit the generalization of the findings. It is concluded that cannabidiol presents therapeutic potential in managing pain associated with TMD, particularly of muscular origin, although further clinical studies are required to establish its efficacy, safety, and clinical applicability.

Keywords: Cannabidiol. Temporomandibular Disorder. Orofacial Pain. Myofascial Pain. Endocannabinoid System.

RESUMO

A disfunção temporomandibular (DTM) constitui um conjunto de condições que afetam a articulação temporomandibular e estruturas associadas, sendo uma das principais causas de dor orofacial não odontogênica. Diante das limitações das abordagens terapêuticas convencionais, o canabidiol (CBD) tem emergido como uma alternativa potencial no manejo da dor, devido às suas propriedades analgésicas, anti-inflamatórias e moduladoras do sistema endocanabinoide. O presente estudo teve como objetivo analisar criticamente as evidências científicas acerca do uso do canabidiol no manejo da dor associada à DTM. Trata-se de uma revisão narrativa de literatura, com abordagem qualitativa, realizada nas bases de dados PubMed, SciELO e ScienceDirect, contemplando publicações no período de 2015 a 2025. Foram incluídos estudos clínicos, revisões e pesquisas experimentais que abordassem direta ou indiretamente a utilização do CBD em dor orofacial, dor miofascial ou DTM. Os resultados evidenciaram uma predominância de estudos indiretos, incluindo revisões e modelos experimentais, com número limitado de ensaios clínicos randomizados. Destacam-se dois estudos clínicos recentes que demonstraram redução significativa da dor e da atividade muscular em pacientes com DTM tratados com canabidiol. Adicionalmente, evidências pré-clínicas indicam efeitos analgésicos e anti-inflamatórios do CBD, reforçando sua plausibilidade biológica. No entanto, a heterogeneidade metodológica dos estudos e a escassez de evidências clínicas robustas limitam a generalização dos achados. Conclui-se que o canabidiol apresenta potencial terapêutico no manejo da dor associada à DTM,

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especialmente de origem muscular, sendo necessários estudos clínicos adicionais para estabelecer sua eficácia, segurança e aplicabilidade clínica.

Palavras-chave: Canabidiol. Disfunção Temporomandibular. Dor Orofacial. Dor Miofascial. Sistema Endocanabinoide.

RESUMEN

La disfunción temporomandibular (DTM) constituye un conjunto de afecciones que afectan la articulación temporomandibular y las estructuras asociadas, siendo una de las principales causas de dolor orofacial no odontogénico. Ante las limitaciones de los enfoques terapéuticos convencionales, el cannabidiol (CBD) ha surgido como una alternativa potencial en el manejo del dolor, debido a sus propiedades analgésicas, antiinflamatorias y moduladoras del sistema endocannabinoide. Este estudio tuvo como objetivo analizar críticamente la evidencia científica sobre el uso de cannabidiol en el manejo del dolor asociado a la DTM. Se trata de una revisión narrativa de la literatura, con un enfoque cualitativo, realizada en las bases de datos PubMed, SciELO y ScienceDirect, que abarca publicaciones desde 2015 hasta 2025. Se incluyeron estudios clínicos, revisiones e investigaciones experimentales que abordaron directa o indirectamente el uso de CBD en el dolor orofacial, el dolor miofascial o la DTM. Los resultados mostraron un predominio de estudios indirectos, incluyendo revisiones y diseños experimentales, con un número limitado de ensayos clínicos aleatorizados. Dos estudios clínicos recientes destacan por demostrar una reducción significativa del dolor y la actividad muscular en pacientes con disfunción temporomandibular (DTM) tratados con cannabidiol. Además, la evidencia preclínica indica efectos analgésicos y antiinflamatorios del CBD, lo que refuerza su plausibilidad biológica. Sin embargo, la heterogeneidad metodológica de los estudios y la escasez de evidencia clínica sólida limitan la generalización de los hallazgos. Se concluye que el cannabidiol presenta potencial terapéutico en el manejo del dolor asociado a la DTM, especialmente el de origen muscular, pero se necesitan más estudios clínicos para establecer su eficacia, seguridad y aplicabilidad clínica.

Palabras clave: Cannabidiol. Disfunción Temporomandibular. Dolor Orofacial. Dolor Miofascial. Sistema Endocannabinoide.

1 INTRODUCTION

Temporomandibular disorder (TMD) is a set of conditions that affect the temporomandibular joint, masticatory muscles, and associated structures, and is considered one of the main causes of non-odontogenic orofacial pain. Its etiology is multifactorial, involving biomechanical, neuromuscular, and psychosocial factors, which contribute to the complexity of diagnosis and clinical management (GOLANSKA et al., 2021). In addition, TMD has a significant impact on patients' quality of life, and can compromise functions such as chewing, speaking, and sleeping, in addition to being frequently associated with chronic pain (WU et al., 2021).

From a pathophysiological point of view, TMD-associated pain is often related to local inflammation and peripheral and central sensitization, mediated by pro-inflammatory substances, such as cytokines and chemokines, especially in cases of myofascial pain. Studies have shown that changes in the expression of inflammatory mediators play a relevant role in pain maintenance and dysfunction progression (QIAO et al., 2023; ZWIRI et al., 2020). In this context, understanding the biological mechanisms involved in myofascial and joint pain is essential for the development of new, more effective therapeutic approaches.

In recent years, cannabidiol (CBD), one of the main non-psychoactive components of *Cannabis sativa*, has been widely investigated due to its analgesic, anti-inflammatory, and endocannabinoid system modulating properties, without showing relevant psychoactive effects. Evidence suggests that CBD acts on the modulation of CB1 and CB2 receptors, in addition to influencing pathways related to the release of inflammatory cytokines and nociceptive transmission (MLOST et al., 2020; PISANTI et al., 2017; SERMET et al., 2021). These effects make CBD a potential therapeutic agent in the management of chronic painful conditions, including those of musculoskeletal origin.

In the field of orofacial pain, recent reviews indicate that cannabinoids, including cannabidiol, may contribute to the reduction of pain and muscle activity in different clinical conditions, although the evidence is still heterogeneous (GROSSMAN et al., 2021; DAVID et al., 2022). Experimental studies also demonstrate that CBD has an analgesic effect in myofascial pain models, reinforcing its biological plausibility in the context of TMD (WONG; CAIRNS, 2019). However, the transposition of these findings into clinical practice still depends on more robust evidence.

Despite the therapeutic potential observed, the scientific literature shows a significant limitation regarding the availability of clinical studies directed at the use of cannabidiol (CBD) in patients with temporomandibular disorder. To date, only two randomized controlled trials have been identified that have directly investigated this application (NITECKA-BUCHTA et

al., 2019; WALCZYŃSKA-DRAGON et al., 2024), which demonstrated a significant reduction in pain and muscle activity in patients with TMD of muscular origin. However, the scarcity of studies and the associated methodological limitations prevent the consolidation of robust clinical evidence. In this context, considering the limitations of conventional treatments and the need for new therapeutic approaches, the present study aims to critically analyze the use of cannabidiol in the management of pain associated with temporomandibular disorder, based on the available scientific evidence.

2 METHODOLOGY

The present study is characterized as a narrative literature review, with a qualitative approach, whose objective was to critically analyze the available scientific evidence on the use of cannabidiol in the management of pain associated with temporomandibular disorder.

The bibliographic search was carried out between January and March 2026, in the PubMed, SciELO, and ScienceDirect databases, including publications in the period from 2015 to 2025. Controlled descriptors and free terms in English and Portuguese were used, based on the MeSH (Medical Subject Headings) and DeCS (Health Sciences Descriptors) vocabularies, including: "cannabidiol", "CBD", "temporomandibular disorders", "TMD", "pain", "orofacial pain" and "myofascial pain". The terms were combined using Boolean operators, using the following search strategy: ("cannabidiol" OR "CBD") AND ("temporomandibular disorders" OR "TMD") AND ("pain" OR "orofacial pain" OR "myofascial pain").

The selection of studies was carried out in stages. Initially, the screening was carried out by reading the titles and abstracts. Subsequently, the potentially eligible studies were submitted to reading in full, being evaluated according to the previously established inclusion and exclusion criteria. At the end of the selection process, 21 articles were included to compose the final sample of the review.

The following inclusion criteria were adopted: complete scientific articles, published between 2015 and 2025, available in indexed databases, written in English or Portuguese, and that directly or indirectly addressed the use of cannabidiol in the context of orofacial pain, myofascial pain or temporomandibular disorder, without restriction on the methodological design, as long as they are relevant to the objective of the study. Duplicate studies, articles outside the established period, studies with themes unrelated to the research objective, as well as studies with an exclusively analytical, methodological or non-clinically relevant focus were excluded.

The included studies included different methodological designs, such as randomized clinical trials, systematic and narrative reviews, as well as experimental studies, allowing

critical and comparative analysis of the available evidence. Data analysis was performed in a descriptive and interpretative manner, considering the methodological design, robustness, and level of evidence of each study. Information such as author, year of publication, type of study, objective, main findings and contributions to the theme were extracted. The findings were organized into previously defined thematic categories, including: pathophysiology of temporomandibular disorder, mechanisms of action of cannabidiol, and clinical and preclinical evidence in pain management.

A narrative review was chosen due to the heterogeneity of the available studies, which present different methodological designs, populations, and interventions, making it difficult to apply systematic methods of synthesis.

As this is a literature review based on secondary data in the public domain, there was no need to submit it to the Research Ethics Committee, in accordance with the current ethical guidelines. It should be noted that all the information used was properly referenced, ensuring the scientific integrity and traceability of the sources.

As a limitation, it is noteworthy that, as it is a narrative review, the study is subject to bias in the selection and interpretation of data, not presenting the rigorous methodological systematization characteristic of systematic reviews. In addition, the heterogeneity of the designs of the included studies may limit the direct comparison between the findings. Even so, we sought to ensure the quality of the analysis through the careful selection of relevant, current, and methodologically consistent studies.

3 RESULTS

The synthesis of the studies included in this review is presented in Table 1, which brings together the main methodological characteristics and relevant findings of the selected studies. A total of 21 studies were analyzed, covering different designs, including randomized clinical trials, systematic and narrative reviews, as well as in vivo and in vitro experimental studies.

There is a predominance of indirect evidence in the literature, mainly from reviews and experimental studies, with a limited number of direct clinical evidence specifically focused on temporomandibular disorder. The analyzed data allow a comparative evaluation of the methodological designs, the populations investigated and the main findings related to the use of cannabidiol in pain management, evidencing both its therapeutic potential and the current limitations of the scientific literature.

Table 1

Summary of included studies on the use of cannabidiol in the management of pain associated with temporomandibular disorder

Article Title	Author/Year	Method (Study Design)	Sample/Model	Main results
Myorelaxant Effect of Transdermal Cannabidiol Application in Patients with TMD	Nitecka-Buchta et al., 2019	Randomized, double-blind, placebo-controlled clinical trial	TMD Patients	Significant reduction in pain and muscle activity
Cannabidiol Intervention for Muscular Tension, Pain, and Sleep Bruxism Intensity	Walczyńska-Dragoń et al., 2024	Randomized, double-blind, placebo-controlled clinical trial	Patients with TMD and bruxism	Significant reduction in pain, electromyographic activity, and bruxism
Cannabidiol, Cannabinol and Their Combinations Act as Peripheral Analgesics	Wong & Cairns, 2019	In vivo experimental study	Animal model of myofascial pain	Peripheral analgesic effect
Cannabidiol has therapeutic potential for myofascial pain	Vivanco-Estela et al., 2021	In vivo experimental study	Animal model of myofascial pain	Reduced pain and inflammation
Cannabis and orofacial pain: A systematic review	Grossman et al., 2021	Systematic review	Clinical Studies in Orofacial Pain	Pain reduction with high heterogeneity
Cannabidiol in Dentistry: A Scoping Review	David et al., 2022	Scoping Review	Dental studies	Indicates therapeutic potential with limitations
Cannabidiol for Pain Treatment: Focus on Pharmacology	Mlost et al., 2020	Narrative review	Preclinical studies	Analgesic and anti-inflammatory action
Cannabidiol: State of the art and new challenges	Pisanti et al., 2017	Narrative review	Experimental and clinical studies	Modulation of the endocannabinoid system
Cannabidiol selectively modulates IL-1 β and IL-6	Sermet et al., 2021	In vitro experimental study	Human cells	Reduction of pro-inflammatory cytokines
Temporomandibular Myofascial Pain Syndrome	Golanska et al., 2021	Narrative review	DTM	Influence of biopsychosocial factors
Therapeutic Agents for Temporomandibular Disorders	Wu et al., 2021	Narrative review	DTM	Diversity of therapeutic approaches
Biomarkers for Temporomandibular Disorders	Zwiri et al., 2020	Narrative review	Biomarkers in TMD	Role of inflammatory cytokines
Chemokine Regulation in Temporomandibular Joint Disease	Qiao et al., 2023	Narrative review	DTM	Role of chemokines in inflammation
Cannabinoid delivery systems for pain and inflammation	Bruni et al., 2018	Narrative review	Pharmacological delivery systems	Influence of route of administration

Molecular and Cellular Mechanisms of Action of Cannabidiol	Martinez Naya et al., 2023	Narrative review	Molecular studies	Cellular modulation of cannabidiol
Effects of endocannabinoids and opioids on orofacial pain	Zubrzycki et al., 2017	In vivo experimental study	Orofacial pain animal model	Orofacial pain modulation
Effectiveness of cannabinoids in neuropathic pain	Boychuk et al., 2015	Systematic review	Clinical studies	Reduction of chronic pain
Patterns of medicinal cannabis use in chronic pain	Baron et al., 2018	Observational study	Patients with chronic pain	Reduction of pain self-reported by patients
Efficacy of topical interventions for TMD	Mena et al., 2020	Systematic review with meta-analysis	Topical interventions in TMD	Limited evidence for CBD
Cannabinoids and Orofacial Pain Management	Weerathataphan et al., 2021	Narrative review	Orofacial pain	Indicates therapeutic potential of cannabinoids
Cannabidiol (CBD) and its analogs: effects on inflammation	Burstein, 2015	Narrative review	Inflammatory processes	Anti-inflammatory effect

Source: Authors.

4 DISCUSSION

The results of this review show that the use of cannabidiol (CBD) in the management of pain associated with temporomandibular disorder (TMD) has relevant therapeutic potential, but supported predominantly by indirect evidence. The analysis of the included studies demonstrates that most of the available research consists of reviews and experimental studies, with a limited number of randomized controlled trials specifically targeting TMD, which imposes restrictions on the consolidation of clinical recommendations based on robust evidence.

From a clinical standpoint, only two identified studies have directly evaluated the use of CBD in TMD patients. The clinical trial conducted by Nitecka-Buchta et al. (2019) demonstrated a significant reduction in pain and muscle activity after transdermal application of cannabidiol, while Walczyńska-Dragoń et al. (2024) observed a significant reduction in pain, electromyographic activity of masticatory muscles, and the sleep bruxism index with the use of CBD-containing formulations. These findings suggest initial clinical efficacy, especially in cases of TMD of muscular origin, but still insufficient to establish consolidated therapeutic recommendations, considering the scarcity of studies and sample limitations.

The predominance of indirect evidence in the literature reinforces the need for cautious interpretation of the findings. Systematic and narrative reviews, including meta-analysis, indicate that cannabinoids, including cannabidiol, have potential to reduce orofacial and

chronic pain, although with high methodological heterogeneity (GROSSMAN et al., 2021; DAVID et al., 2022; BOYCHUK et al., 2015; MENA et al., 2020; WEERATHATAPHAN et al., 2021). In addition, observational studies suggest pain improvement in patients who use medical cannabis, although without strict control of variables and at risk of bias (BARON et al., 2018). Thus, although the findings are promising, they do not replace controlled and standardized clinical evidence.

Regarding biological plausibility, experimental studies present consistent results and contribute significantly to the understanding of CBD's mechanisms of action. Evidence indicates that cannabidiol exerts a peripheral analgesic effect in myofascial pain models (WONG; CAIRNS, 2019), in addition to reducing pain and inflammation under experimental conditions (VIVANCO-ESTELA et al., 2021; ZUBRZYCKI et al., 2017). Additionally, in vitro studies demonstrate that CBD modulates the production of inflammatory cytokines, such as IL-1 β and IL-6 (SERMET et al., 2021), corroborating its anti-inflammatory action. However, it is observed that, although preclinical studies present consistent results, these findings have not yet been fully confirmed in human clinical studies.

These mechanisms are supported by reviews describing CBD's role in the endocannabinoid system and in pathways related to nociception and inflammation (MLOST et al., 2020; PISANTI et al., 2017; MARTINEZ NAYA et al., 2023; BURSTEIN, 2015). The modulation of inflammatory receptors and mediators suggests that cannabidiol can act on both the peripheral and central phases of pain, which is particularly relevant in conditions such as TMD, characterized by peripheral and central sensitization.

The pathophysiology of TMD also contributes to the interpretation of the observed effects. Studies indicate that pain in this condition is associated with inflammatory processes, with the participation of cytokines and chemokines (ZWIRI et al., 2020; QIAO et al., 2023), as well as biopsychosocial factors that influence pain perception (GOLANSKA et al., 2021). The diversity of therapeutic approaches described in the literature (WU et al., 2021) reinforces the complexity of TMD and the need for multimodal therapeutic strategies.

Another relevant aspect concerns the forms of administration of cannabidiol, since different delivery systems can influence its therapeutic efficacy (BRUNI et al., 2018). In this context, topical and transdermal routes have potential clinical applicability in dentistry, especially in the management of orofacial pain, although they still lack standardization regarding dosage and form of use.

In this sense, there is a mismatch between the robustness of the preclinical findings and the limited clinical evidence available, which reinforces the need for caution in the interpretation of the results and in the clinical application of cannabidiol in the context of TMD.

Despite the advances observed, this review highlights important limitations in the current literature. The heterogeneity of the designs, the predominance of experimental studies, and the scarcity of randomized clinical trials specific to TMD limit the robustness of the conclusions. In addition, the lack of standardization regarding doses, routes of administration, and duration of treatment makes it difficult to compare studies and define clinical protocols.

Thus, although cannabidiol presents itself as a promising alternative in the management of pain associated with temporomandibular disorder, especially in cases of muscular origin, additional clinical studies are needed, with greater methodological rigor, representative samples, and standardization of protocols, to establish its efficacy, safety, and clinical applicability consistently. In this context, the available data support biological plausibility and indicate initial clinical benefits; However, the current evidence base is still insufficient to support robust clinical recommendations.

5 CONCLUSION

The present study showed that cannabidiol (CBD) has relevant therapeutic potential in the management of pain associated with temporomandibular disorder, especially in conditions of muscular origin. The findings indicate that CBD has analgesic and anti-inflammatory properties, supported by consistent experimental evidence and biological mechanisms related to the modulation of the endocannabinoid system and the regulation of inflammatory mediators.

However, the critical analysis of the literature demonstrates that direct clinical evidence is still limited, being based on a small number of randomized controlled trials. Thus, despite the promising results, it is not possible, at the moment, to establish definitive clinical recommendations regarding the use of cannabidiol in the treatment of temporomandibular disorder.

In addition, significant heterogeneity was observed among the studies, especially in relation to doses, routes of administration, and methodological designs, which makes it difficult to standardize therapeutic protocols and compare findings.

In view of this, it is concluded that cannabidiol represents a promising therapeutic alternative, but still in the phase of scientific consolidation. The need for additional clinical studies with greater methodological rigor, representative samples, and standardization of interventions is emphasized, in order to establish their efficacy, safety, and clinical applicability in the context of temporomandibular disorders.

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