Photobiomodulation as a Therapeutic Strategy in Burning Mouth Syndrome: A Scoping Review

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Abstract: Burning mouth syndrome (BMS) is considered an atypical oral clinical-symptomatological condition because its etiopathogenesis is not yet fully clarified. It is mainly characterized by the symptom of burning, which occurs chronically and with various intensities. It is essential for making a diagnosis of BMS, clinical negativities, and instrumental investigations. It mainly affects the female sex, in the pre-post-climactic phases. A peripheral neuropathic matrix of the pain symptoms has been repeatedly demonstrated. However, this subjectivity is associated with personalities with anxiety-depressive traits, affective-behavioral difficulties, and disorders of the psycho-algogenic sphere. Numerous treatments are reported in the literature, which have rarely met lasting healing parameters. In this clinical landscape, photobiomodulation therapy (PBMT) can be considered a possible therapeutic alternative. Our study aims to present a scoping review of how photobiomodulation is used in BMS therapy and to analyze the outcome of the therapy. A literature review focused on the photobiomodulation treatment for burning mouth syndrome was conducted in the main scientific databases: PubMed, SCOPUS, and Web of Science. The results of our research highlight encouraging results regarding photobiomodulation, as in all studies, there is a reduction in symptoms.

Keywords: low-level laser therapy; photobiomodulation; burning mouth syndrome; neuropathic pain

1. Introduction

Burning mouth syndrome (BMS) is categorized as an idiopathic oral condition due to its yet-to-be-fully-understood etiology and pathogenesis, along with its atypical symptomatology and clinical characteristics [1–3]. In 1994, the International Association for the Study of Pain (IASP) identified three distinct groups of chronic oral and facial pain with neurogenic, vascular, and idiopathic origins.

Subsequently, the Headache Classification Committee of the International Headache Society (IHS) in 2013 and 2018, along with the International Classification of Orofacial Pain (ICOP) in 2020, defined BMS as “Intraoral burning or dysesthesia sensation, recurring daily for more than 2 h per day over more than 3 months, without clinically evident causative lesions”. A diagnosis of BMS is confirmed when individuals report oral burning symptoms without any observable clinical signs, and diagnostic investigations reveal a normal condition [2–4].

When oral symptomatology has a definable local and systemic cause, and locally there are clinical signs or instrumental tests that testify to a disease, it is correct to speak of secondary BMS [5,6].

Factors that can cause intraoral burning include iron, zinc, vitamin B12 or folic acid deficiencies, pharmacological causes, hyposalivation, Sjögren’s syndrome, erosive
and ulcerative lesions of the mucosa, oral infections, inappropriate prostheses, and para-functional habits [5,6]. When we have an oral burning pain condition, without clinical signs and with an unknown origin, we will speak instead of primary BMS or idiopathic BMS [6–8].

The various etiological and pathophysiological aspects would lead to considering primary BMS as a complex multifactorial clinical condition, although it has also been associated with psychological and endocrinological disorders [9–12].

In the late 1980s, neurophysiological, neuropathological, and imaging studies led to the hypothesis that BMS could be a neuropathic pain condition [13–16]. Therefore, we can consider at least three lines of research that have characterized the studies on the etiology and pathogenesis of idiopathic BMS: a peripheral and central neurological basis, and an endocrinological and psychological matrix [8]. The pathophysiology of BMS is still unknown [8].

Three distinct subclasses of primary burning mouth syndrome (BMS) can be identified. The first subgroup (50–65%) is characterized by peripheral neuropathy affecting the small diameter fibers of the intra-oral mucosa. The second subgroup (20–25%) comprises patients with subclinical trigeminal lingual nerve system pathology, which clinically resembles the other two subgroups. The third subgroup (20–40%) aligns with the concept of central pain, potentially linked to the reduced function of dopaminergic neurons in the basal ganglia [8]. The development of neuropathic pain in primary BMS is thought to be closely related to small fiber damage. Recent studies in primary BMS have emphasized the role of small myelinated A\(\delta\) fibers and unmyelinated C fibers [15,17,18]. Additionally, approximately 50% of patients with primary BMS experience significant pain relief after lidocaine anesthesia of the lingual nerve, suggesting a peripheral origin of the pain [18]. The taste and pain neurological circuits appear to be intricately interconnected. Damage to the chorda tympani results in the inhibition of its function, leading to reduced control over the activity of other nerves. Consequently, deafferentation of the A\(\delta\) gustatory fibers of the chorda tympani nerve may result in lingual burning pain symptoms [19,20]. Alternatively, the diminished signaling of A\(\delta\) channels with preserved C-fiber function could also contribute to the burning pain experienced in primary BMS [8,21].

Patients with BMS often report dysgeusia or phantom taste sensations. [8,21–25]. In the pathogenesis of primary BMS, the possible involvements of the central nervous system related to the sensorium of the mouth and face regions have been considered [26,27]. Alterations in the basal ganglia would cause signs of dopaminergic system dysfunction, like Parkinson’s disease, and bilateral oral pain distribution. The dopaminergic system has a pain-inhibitory role [25–30]. The blink reflex habituation, reflecting depletion of endogenous dopamine in the putamen, as is usually seen in Parkinson’s disease, suggests the hypothesis that ineffective endogenous inhibitory pain control by the brain dopamine-opioid system predisposes the individual patient to chronic neuropathic pain [27,28]. Furthermore, patients with primary BMS report similar benefits from sleep duration as those with Parkinson’s disease, due to increased brain dopamine tone during nighttime sleep. Also, patients diagnosed with major depression reported BMS, and this pathology has been associated with decreased brain dopamine. Genetic studies provide other insights into low brain dopamine tone in the etiology of BMS. The C957T dopamine D2 receptor polymorphism affects D2 receptor function in the striatum and influences the synaptic concentration of endogenous dopamine; homozygotes for the T allele have the lowest dopaminergic tone in the striatum and appear to be more common in patients with facial neuropathic pain, including primary BMS T alleles that are also found in patients with facial neuropathic pain, including primary BMS [29–32]. Sex hormones have neuroprotective effects and modulate the function of various neurotransmitters and peripheral receptors [33,34]. In 2009, it was highlighted that in subjects after menopause, there was a deficiency or dysfunction of adrenal steroids with decreased neuroprotective effects on neural tissues [13]. It has been seen that a deficiency of ovarian hormones would lead to an atrophy of the lining epithelia, including the lingual
and oral ones. Interestingly, this epithelial atrophy was observed in parallel with the reduction of unmyelinated C fibers [35–37]. The high prevalence of anxiety disorders and depression seen in BMS is associated with a history of chronic post-traumatic stress and chronic major anxiety leading to impaired adrenal steroid production. Among the various dysfunctional pain disorders, BMS is characterized by underlying hypercortisolism [38–40], which reaches 70% in primary BMS [41]. Initially, it was thought that dry mouth was only a subjective impression of BMS patients and not due to reduced actual salivary flow. However, it was possible to confirm that, compared to healthy subjects, the salivary flow was slightly reduced when unstimulated and did not change when stimulated with lemon [42]. It has been hypothesized that neuroprotective steroid deficiency leads to reduced function of the minor salivary glands and contributes to the induction of xerostomia. It has been confirmed that alterations of the emotional-instinctive and psycho-anxiety dimensions are conditions commonly encountered in BMS patients. However, no significant differences were found between the emotional and psychological characteristics of BMS patients and chronic pain patients [31,43–46]. Interestingly, most of the psychiatric and personality disorders associated with BMS have low brain dopamine tones in common. [47–51]. The purpose of our scoping review is to investigate whether photobiomodulation can be useful in the treatment of the disease and which protocols have been studied up to now.

2. Materials and Methods

2.1. Focused Questions

Can photobiomodulation be useful in the treatment of burning mouth syndrome? What are the protocols used in photobiomodulation therapy?

2.2. Eligibility Criteria

This review followed specific inclusion and exclusion criteria. The inclusion criteria were as follows: (I) the study model should be interventional studies, observational studies, cohort studies, or case series/case reports studies; (II) participants must be diagnosed with burning mouth syndrome; (III) the intervention under investigation should be photobiomodulation; and (IV) the outcome of interest should be clinical results for neuropathic pain treatment. Only studies that met all these inclusion criteria were considered in the review.

On the other hand, certain studies were excluded based on the following exclusion criteria: (I) articles published in non-English languages that were available only in abstract form; (II) duplicate studies that were identical or substantially overlapped with other included studies; (III) studies not relevant to the purpose of the full-text articles, or not suitable for addressing the focused questions, such as those analyzing different supplementary treatments or whose content did not match the abstract; (IV) ex vivo or experimental animal studies, which did not involve human participants; (V) studies lacking approval from an ethics committee; and (VI) narrative reviews, systematic reviews, or systematic and meta-analysis reviews, which were not in the scope of this particular review.

2.3. Search Strategy

In accordance with the JBI methodology for scoping reviews, the research process involved three main steps: (i) an initial limited search conducted on databases like PubMed (MEDLINE), Scopus, and Web of Science; (ii) selection of key terms from the retrieved articles to create an effective search strategy; and (iii) an additional search of the reference lists of all included articles to identify further relevant research.

Furthermore, the review followed the PCC model, which revolves around three essential elements: population (individuals undergoing PBMT procedures), concept (PBMT as a treatment for neuropathic pain), and context (without restricting the review to any specific cultural aspect or setting). The review focused on analyzing the
abstracts of studies that examined the effects of photobiomodulation procedures and their clinical outcomes.

Throughout the literature review process, the preferred reporting items for scoping reviews (PRISMA-ScR) consensus guidelines were adhered to (see Table S1, Supplementary Materials).

2.4. Research

The Medical Subject Heading (MeSH) terms used for the search included burning mouth syndrome, stomatopyrosis, photobiomodulation, photobiomodulation therapy, and low-level laser therapy. An electronic search was conducted on PubMed (MEDLINE), Scopus, and Web of Science databases, focusing on articles published between 2010 and 2023. The data extraction phase took place from February 2023 to April 2023, with the last search performed on 15 April 2023.

Four reviewers (F.P., M.Po., M.G., and M.Pe.) carried out the search, and any disagreements or discrepancies were resolved through consensus, with input from two additional reviewers (F.S. and M.B.). Titles and abstracts of the initially retrieved articles were thoroughly analyzed, and studies that were not relevant were excluded. Full texts of all relevant articles were reviewed and scrutinized, with findings documented, and similar studies meeting the inclusion criteria were identified. The present protocol has been registered on the Open Science Framework platform with the registration https://osf.io/a9hqu (accessed on 8 May 2023). The detailed strategies employed for each electronic database search are presented in Table S2 (Supplementary Materials).

2.5. Quality Assessment of Included Studies

A methodological quality risk of bias assessment was used in this review, JBI critical appraisal for randomized controlled trials.

3. Results

The primary search identified 186 articles based on MeSH terms. Following this, 160 articles were removed (5 abstracts of articles published in non-English languages, 98 duplicates, and 57 because they were not pertinent), and 26 articles were screened based on title and abstracts. The remaining 15 full-text articles were assessed for eligibility. Additionally, 4 full-text articles were further excluded because they were irrelevant articles. The 11 relevant articles were finally included and analyzed in this review. The flow chart of the review process is described in Figure 1.

Risk of Bias

The JBI critical appraisal tool was applied to assess the risk of bias in the studies included in this review (Table 1), using the judging criteria for risk of bias shown in Table S3 (Supplementary Materials).
Table 1. The risk of bias in randomized controlled trials is represented by symbols (green for low risk of bias, yellow for high risk of bias, and blue for uncertain or unavailable data and medium risk of bias).

<table>
<thead>
<tr>
<th>Author and Year of Publication</th>
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Figure 1. Flow chart of the review process.

4. Discussion

The response to treatment in patients with primary BMS is influenced by various pathological factors, including neuropathic components, central vulnerability, and psychiatric comorbidity. These problems are often intricate and interconnected, and addressing them requires a comprehensive approach rather than relying on a single therapy [50]. Like other neuropathic pain conditions, BMS poses challenges in treatment. On average, only 40% of patients experience benefits from their current neuropathic pain medications [51].

Another issue related to BMS treatment is the lack of consistent and continuous medication usage. While psychotropic medications show effectiveness in BMS treatment, approximately 15% of patients discontinue their medication. Implementing motivational interviewing can enhance appropriate adherence to medication [52,53]. Often, a combination of medications is recommended, along with treatments utilized for other neuropathic pain conditions [52,53]. Tricyclic antidepressants such as amitriptyline and clomipramine have been tried for BMS, with only 19% of patients reporting very poor outcomes and side effects such as dry mouth [54,55]. Antidepressants belonging to the group of selective serotonin reuptake inhibitors (SSRIs) such as chlordiazepoxide, diazepam, amisulpride, paroxetine, or sertraline hydrochloride have also been recommended with good results, but with the most side effects such as dizziness, insomnia, nausea, and somnolence [54,55].

Trazodone was not effective in improving BMS symptoms [56]. Anticonvulsants such as gabapentin and pregabalin are routinely recommended in the pharmacotherapy of BMS,
but therapeutic success has not been achieved [55,56]. Systemic and local treatment with clonazepam should be considered in the treatment of BMS.

Clonazepam is a benzodiazepine and a γ-aminobutyric acid (GABA) receptor agonist. This receptor is widely present in the central nervous system and peripheral tissues, and this drug acting on this receptor may have positive results in the treatment of this syndrome [55–58]. Pure small-fiber peripheral neuropathy may be better controlled with local clonazepam and central mechanisms may benefit more from systemic clonazepam [55–58]. Clonazepam, like other benzodiazepines, can cause side effects, mainly drowsiness, impairment of memory and cognitive functions, and dependence on long-term use. Although systemic absorption is low, no side effects have been reported with topical application [55–58].

α-lipoic acid (ALA) has been used to treat diabetic neuropathy because it is thought to act as a co- and coenzyme, produce energy (ATP), improve glucose metabolism and stimulate nerve growth factor (NGF) production. In addition, ALA stimulates the elevation of cellular glutathione levels and may prevent peripheral neuropathy [59–63].

There have been indications for the use of capsaicin in the pharmacological management of burning pain. Capsaicin induces desensitization and depletion of substance P leading to analgesia. A double-blind cross-over study revealed that a 0.025% capsaicin mouth rinse significantly reduced pain with no side effects [63–66]. Additionally, various topical treatments, such as saliva substitutes, may be helpful when a peripheral mechanism is suspected [66].

To talk about photobiomodulation, it is necessary to start from the assumption that light is a type of electromagnetic radiation and is considered an indispensable source of energy. A photochemical reaction is normally induced by the interaction of light, particularly ultraviolet, visible, and near-infrared light, with external matter. There are numerous examples of interactions between light and biological systems: photosynthesis; the reactions of the photoreceptors of the retina; the synthesis of vitamin D [67].

Since 2015, we have been talking about photobiomodulation (PBM) to describe the scientific basis of the use of non-ionizing electromagnetic energy to trigger photochemical changes within cellular structures and tissues [68].

PBM has analgesic and anti-inflammatory therapeutic effects, can stimulate biological tissues, and has documented antimicrobial effects [68].

Therefore, the correct use of the PBM can relieve painful symptoms, significantly reduce an inflammatory process, and accelerate and improve the healing of damaged tissues [69].

The mechanism of action of PBM is not yet fully understood. The most popular theory is that light is absorbed by mitochondrial cytochrome C oxidase (CcOx), causing an increase in adenosine triphosphate (Adenosine TriPhosphate ATP) [69,70].

PBM, on the other hand, can induce a brief rise in reactive oxygen species (ROS) before decreasing oxidative stress. Nitric oxide (NO) competes with oxygen and binds to CcOx in cells with varying degrees of hypoxia, limiting oxygen use and thus mitochondrial cell respiration. PBM may restore this inhibition by dissociating NO from its binding location on CcOx, allowing mitochondria to enhance ATP synthesis and cellular energy [69,70].

Another possible mechanism of PBM could be an increase in the concentrations of Ca^{2+} ions, important for cellular metabolism and homeostasis, and cellular signal transmissions. Furthermore, the cellular temperature changes after a PBM must be considered [67–73].

PBM is not considered a heat treatment; however, selective absorption by CcOx can lead to intracellular thermal micro-changes that can positively influence the behavior of cells and tissues [73,74].

The analgesic properties of PBM have been repeatedly recognized. It has been seen to reduce chronic low back pain, chronic neck pain, and other types of chronic pain such as BMS [49,74–79].

Furthermore, at the oral level, it has proved to be useful in preventing and treating oral mucositis in cancer patients, in reducing pain and swelling after third molar extraction,
in suffering from the temporomandibular joints, in orthodontic pain, and in reducing inflammation of the oral lichen [49,80–88].

Primary BMS is to be considered a chronic oral pain pathology where PBM could perform a part of the new local therapeutic strategies. Indeed, in recent years, with the diagnostic and cognitive advances of the disease, PBM has emerged as a potential non-invasive treatment with no apparent side effects.

Many therapeutic experiences have provided encouraging results in the reduction of oral burning symptoms. However, further therapeutic experiences will be needed to confirm and better protocol PBM treatments and correctly relate them to the clinical and symptomatic data of patients with BMS [57–60].

In the analysis of the results in the literature, there are some studies where an improvement in pain symptoms in patients with BMS has been found. Sleep values were compared and measured with the VAS and the improvement rates ranged from 4 to 15% [58,59,62].

The study conducted by Scardina et al. highlights the improvement in microcirculatory patterns after photobiomodulation was applied in patients with BMS, analyzed by videocapillaroscope. The improvement of the pattern has been noticed lasting for a long time after the therapy [56].

As regards the parameters used by the authors of the articles analyzed, the wavelengths used are variable, from a minimum of 685 nm [55] to a maximum of 1064 nm [38] with a preference; however, for the wavelength of 810–830 nm [52–54,56,57,59,62]. All the studies confirm the improvement of the symptoms. For the evaluation of the symptoms, the OHIP-14 questionnaires and the VAS scale were mainly used [52–62]. In fact, all the studies report an improvement in VAS scale values and OHIP values, especially after almost three applications of photobiomodulation. The follow-up shows a prolonged analgesic effect, which was found by Hanna et al., even nine months after discontinuation of treatment. In all studies, the absence of side effects of photobiomodulation is highlighted, even in follow-ups. The therapy is well accepted by the patients and easy to perform for the operator. Finally, it should be noted that the results of the improvement in the quality of life are recorded on average after seven weeks of application of the therapy, with an average of one session per week.

Table 2 shows the results of the literature review that satisfies the proposed research questions are summarized.
### Table 2. Results of the literature review.

<table>
<thead>
<tr>
<th>Author and Year of Publication</th>
<th>Type of Laser</th>
<th>Power</th>
<th>Wavelength</th>
<th>Application Method</th>
<th>Number of Application Spots</th>
<th>Time of Application</th>
<th>Number of Sessions</th>
<th>Questionnaires for Symptoms Evaluation</th>
<th>Outcome</th>
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<td>Bardellini et al., 2019 [52]</td>
<td>Diode Laser</td>
<td>3.2 W</td>
<td>660–970 nm</td>
<td>Scanning method</td>
<td>Variable per patient, depending on the most painful points</td>
<td>3° 51” each spot</td>
<td>10 applications once a week</td>
<td>VAS, OHIP-14</td>
<td>Symptoms improvement</td>
</tr>
<tr>
<td>De Pedro et al., 2020 [53]</td>
<td>Diode Laser</td>
<td>0.6 W</td>
<td>810 nm</td>
<td>Scanning method, pulsed wave</td>
<td>56 points (3 in the vestibular mucosa of the 4 quadrants, 4 in each lip mucosa, 6 in each of the two buccal mucosa, 6 in the hard palate, 4 on each lateral edge of tongue, 6 in the dorsal of the tongue and 4 sublingual points, with a distance in between of 2 mm.)</td>
<td>10 s each spot</td>
<td>10 applications once a week</td>
<td>VAS, SF-36, OHIP-14, Epworth, SCL-90, McGill</td>
<td>Symptoms improvement</td>
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<tr>
<td>Hanna et al., 2022 [54]</td>
<td>Diode Laser</td>
<td>200 mW</td>
<td>810 nm</td>
<td>Scanning method, continuous wave</td>
<td>9 spots</td>
<td>30 s each spot</td>
<td>10 applications twice a week</td>
<td>EQ-5D-5L</td>
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<tr>
<td>Lončar-Brzak et al., 2022 [55]</td>
<td>GaAlAs</td>
<td>30 mW</td>
<td>685 nm</td>
<td>Scanning method</td>
<td>3 spots</td>
<td>381 seach spot</td>
<td>10 applications once a day</td>
<td>OHIP-14, VAS</td>
<td>Symptoms improvement</td>
</tr>
<tr>
<td>Scardina et al., 2020 [56]</td>
<td>Diode Laser</td>
<td>4 W</td>
<td>800 nm</td>
<td>Scanning method, continuous wave</td>
<td>4 spots</td>
<td>300 seach spot</td>
<td>8 applications twice a week</td>
<td>VAS</td>
<td>Symptoms improvement, changes in microcircular pattern</td>
</tr>
<tr>
<td>Sikora et al., 2018 [57]</td>
<td>GaAlAs</td>
<td>100 mW</td>
<td>830 nm</td>
<td>Scanning method, pulsed wave</td>
<td>Variable per patient, depending on the most painful points</td>
<td>5 min each session</td>
<td>10 applications once a week</td>
<td>VAS, OHIP-14, OHIP-CRO-14</td>
<td>Symptoms improvement</td>
</tr>
<tr>
<td>Spanemberg et al., 2015 [58]</td>
<td>Diode Laser</td>
<td>100 mW and 35 mW</td>
<td>830 nm and 685 nm</td>
<td>Scanning method, continuous wave</td>
<td>apex of the tongue (3 points), side of the tongue (4 points), dorsum of the tongue (10 points), buccal mucosa (8 points), labial mucosa (5 points), hard palate (8 points), soft palate (3 points), and gums or alveolar ridge mucosa (3 points per sextant)</td>
<td>50–58 seach spot, 50 s for 830 nm wave and 58 s for 685 nm wave</td>
<td>10 applications once a week</td>
<td>OHIP-14</td>
<td>Symptoms improvement</td>
</tr>
<tr>
<td>Sugaya et al., 2016 [59]</td>
<td>GaAlAs</td>
<td>120 mW</td>
<td>790 nm</td>
<td>Scanning method, continuous wave</td>
<td>Variable per patient, depending on the most painful points</td>
<td>50 seach spot</td>
<td>4 applications twice a week</td>
<td>VAS</td>
<td>Symptoms improvement</td>
</tr>
</tbody>
</table>
Table 2. Cont.

<table>
<thead>
<tr>
<th>Author and Year of Publication</th>
<th>Type of Laser</th>
<th>Power</th>
<th>Wavelength</th>
<th>Application Method</th>
<th>Number of Application Spots</th>
<th>Time of Application</th>
<th>Number of Sessions</th>
<th>Questionnaires for Symptoms Evaluation</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sun et al., 2021 [60]</td>
<td>Nd: YAG</td>
<td>100 mW</td>
<td>1064 nm</td>
<td>Scanning method, pulsed mode</td>
<td>Variable per patient, depending on the most painful points</td>
<td>30 sper cm²</td>
<td>4 applications once a week</td>
<td>VAS</td>
<td>Symptoms improvement</td>
</tr>
<tr>
<td>Arduino et al., 2016 [61]</td>
<td>GaAlAs</td>
<td>300 mW</td>
<td>980 nm</td>
<td>Scanning method, continuous wave</td>
<td>Variable per patient, depending on the most painful points</td>
<td>10 seach spot</td>
<td>5 applications once a week</td>
<td>VAS, McGill, OHIP-49, Hospital Anxiety and Depression Scale</td>
<td>Symptoms improvement</td>
</tr>
<tr>
<td>Valenzuela et al., 2017 [62]</td>
<td>GaAlAs</td>
<td>1 W</td>
<td>815 nm</td>
<td>Scanning method, continuous wave</td>
<td>Variable per patient, depending on the most painful points</td>
<td>6 seach spot</td>
<td>4 applications once a week</td>
<td>VAS, OHIP-14</td>
<td>Symptoms improvement</td>
</tr>
</tbody>
</table>

Abbreviations: EQ-5D-5L, European Quality of Life-5 Dimensions-5 Levels; McGill, McGill Pain Scale; OHIP-CRO-14, Oral Health Impact Profile-Croatian-14; OHIP-14, Oral Health Impact Profile-14; OHIP-49, Oral Health Impact Profile-49; SF-36, Short Form Health Survey-36; SCL-90, Symptom Checklist-90.
5. Conclusions

Various treatment options for BMS exist, but their efficacy based on evidence-based research remains unsatisfactory due to the diversity of studies and treatments employed. Among the treatments investigated, clonazepam and ALA have shown promising results in multiple studies, but further research with larger sample sizes is required to establish them as a first-line treatment for BMS patients. Notably, some studies have demonstrated similar outcomes between treatment and placebo evaluations, emphasizing the importance of exploring the psychological and/or psychiatric characteristics of patients. A multidisciplinary approach may be necessary for addressing BMS treatment. Photobiomodulation represents a potential therapeutic strategy for managing burning mouth symptoms. However, further investigation is warranted to fully understand its effectiveness in BMS treatment. Numerous studies on patients confirm that laser treatment can alleviate symptoms, with long-lasting effects. The advantages of this therapy are the easy execution by the clinician, the lack of adverse effects, and the good compliance by the patient. Despite this, it should be emphasized that it would be advisable to conduct future studies on larger patient samples; to standardize the operating protocols both in terms of therapeutic sessions, wavelengths to be used, and tests necessary to formulate a diagnosis precise; and correct classification of the symptomatology.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/app13158880/s1, Table S1: PRISMA-ScR Checklist; Table S2: Search strategies for electronic databases; Table S3: JBI critical appraisal checklist for randomized controlled trials, a tool used for risk of bias assessment.

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Conflicts of Interest: The authors declare no conflict of interest.

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44. Agha-Hosseini, F.; Mirzaii-Dizgah, I.; Mirjalili, N. Relationship of stimulated whole saliva cortisol level with the severity of a feeling of dry mouth in menopausal women. *Gerodontology* 2012, 29, 43–47. [CrossRef] [PubMed]  


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