Keywords
Oral lichen planus; photobiomodulation; platelet-rich plasma; precision medicine; Janus kinase inhibitors.

Authors
Kiranbala Jena, MDS*[1],
[1] MDS, Postgraduate Trainee, Department of Public Health Dentistry, Kalinga Institute of Dental Sciences (KIDS), Kalinga Institute of Industrial Technology (KIIT) Deemed to be University, Bhubaneswar–751024, Odisha, India. ORCID: 0009-0001-3721-3128kironmayeejena@gmail.com

Ipseeta Menon, MDS, PhD[2],
[2] MDS, PhD, Professor, Department of Public Health Dentistry, Kalinga Institute of Dental Sciences (KIDS), Kalinga Institute of Industrial Technology (KIIT) Deemed to be University, Bhubaneswar–751024, Odisha, India. ORCID:0000-0003-0112-8666ipseetam@gmail.com

Gunjan Kumar, MDS, PhD[3],
[3] MDS, PhD, Professor and Head, Department of Public Health Dentistry, Kalinga Institute of Dental Sciences (KIDS), Kalinga Institute of Industrial Technology (KIIT) Deemed to be University, Bhubaneswar–751024, Odisha, India. ORCID: 0000-0002-8663-8472, drgk1014@gmail.com

***Corresponding author: Dr. Ipseeta Menon**
* MDS, PhD, Professor, Department of Public Health Dentistry, Kalinga Institute of Dental Sciences (KIDS), Kalinga Institute of Industrial Technology (KIIT) Deemed to be University, Bhubaneswar–751024, Odisha, India.ORCID:0000-0003-01128666 ipseetam@gmail.com

Received-15-06-2026
Revised-17-07-2026
Accepted-20-07-20.26
Doi:10.1922/ejprd.v34i5s.1528

Therapeutic Advances in Oral Lichen Planus: A Scoping Review of Emerging and Precision-Based Treatment Strategies

Abstract
Background: Oral lichen planus (OLP) is an inflammatory condition caused by the immune system that affects quality of life and has the potential for malignant transformation. Topical corticosteroids are the first-line treatment; however, recurrence and side effects have limited their long-term efficacy, leading to an increased demand for targeted and regenerative therapies.
Objective: The aim of this review is to outline the currently available evidence on both conventional and novel strategies for OLP management and to review their clinical outcomes.
Methods: This scoping review was conducted according to the Joanna Briggs Institute (JBI) methodology and the PRISMA-ScR guidelines. PubMed, Scopus, and Web of Science were searched for eligible studies evaluating OLP therapies. Data were categorized according to treatment modality and narratively synthesized.
Results: A total of 35 studies comprising different therapeutic modalities were included. These studies demonstrated significant improvements in pain, lesion management, mucosal healing, and patient-reported outcomes. However, direct comparisons were hindered by significant variations in trial design, treatment protocols, outcome measures, and follow-up duration.
Conclusion: Precision-based and regenerative therapies are becoming increasingly prevalent in the management of OLP. However, long-term follow-up studies and additional clinical trials are needed to determine their effectiveness and safety.

1.INTRODUCTION

Oral lichen planus (OLP) is a long lasting, immune mediated inflammatory disease of muco-cutaneous origin. The estimated global prevalence is around 0.5% to 2%.[1]Mostly, it is prevalent in middle aged ,older adults and more common in women. Clinically, OLP can appear as reticular, papular, plaque like, atrophic, erosive or even bullous lesions and it involves buccal mucosa, tongue, gingiva and the labial mucosa.[1,2] The reticular type has not much symptoms, but the erosive and atrophic forms, has a burning feeling and more chances of turning into malignancy.[1,2]World Health Organization listed OLP as an oral potentially malignant disorder, so it demands a careful long term follow up and therapeutic action.[1,2]

The management of OLP focus on relieving symptoms, mucosal inflammation and help lesions in healing, and overall well being while keeping treatment related side effects. Topical corticosteroids is the first-line approach since their anti-inflammatory effect is well proven and in most patients there is a good clinical response.[2,3] The recurrence after stopping therapy develops steroid resistance, incomplete remission and adverse events like oral candidiasis and mucosal atrophy. [2][3] Because of this, more and more focus is towards finding safer, yet also more effective alternatives, which can deliver more long lasting disease control.[2][3]

Over the past decade, there has been a progress towards the development of new therapeutic approaches for OLP. Besides the usual pharmacological agents, more and more focus is being on photobiomodulation therapy, photodynamic therapy, platelet rich plasma, injectable platelet rich fibrin, probiotics, herbal and antioxidants, and nanotechnology based drug delivery systems, as well as targeted immunomodulatory therapies, including Janus kinase inhibitors.[3] A number of these interventions have shown promising clinical results, in the decreasing pain, lesion resolution improves and tissue regeneration seems more robust. [3]. Overall ,these advances suggest a slow but steady shift away from purely symptom driven care, towards regenerative and precision based options, designed around the actual biological mechanisms driving the disease.[3]

Therefore, the present scoping review was undertaken to comprehensively map the current evidence on conventional, emerging, regenerative, and precision-based therapeutic interventions for oral lichen planus. In addition to summarizing the reported clinical outcomes associated with these therapies, this review aims to identify research trends, evaluate existing evidence gaps, and provide directions for future clinical research and evidence-based management of OLP.

2.METHODS

2.1Study Design

This scoping review was conducted in accordance with the Joanna Briggs Institute (JBI) methodology for scoping reviews and is reported following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) guidelines. The review protocol was prospectively registered on the Open Science Framework (OSF) with the registation ID 7mkgv.

Though the exact etiology of OLP is still unknown, people generally think its pathogenesis is multifactorial with a kind of interplaying between genetic vulnerability, environmental triggers, epithelial barrier dysfunction and then dysregulated immune responses too. The mechanism of OLP is cell mediated immunity with activated $CD8^+$ cytotoxic T lymphocytes driving apoptosis of basal keratinocytes via inflammatory cytokines, multiple intracellular signalling pathways that get switched on.[2] More recent evidence emphasizes that oxidative stress along with cytokine networks, and Janus kinase signals act as transducer and activator of JAK/STAT pathway.[3] Alterations in the oral microbiome involved both initiation and persistence of the disease.[2]

The review question was developed using the Population–Concept–Context (PCC) framework recommended by the JBI.

2.2Eligibility Criteria

Studies published in English between January 2015 and December 2025 that evaluated conventional, emerging, regenerative, or precision-based therapies for oral lichen planus (OLP) in human participants were eligible for inclusion. Randomized controlled trials, non-randomized clinical trials, cohort studies, case-control studies, cross-sectional studies, case series, case reports and protocols were considered. Studies involving in vitro or animal experiments, conference abstracts, editorials, letters to the editor, expert opinions, narrative reviews and articles not published in English were excluded.

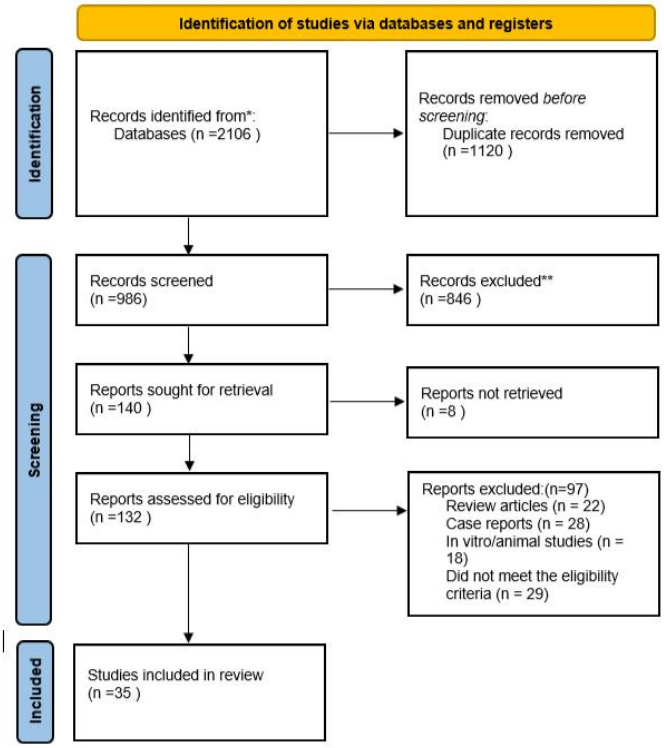
A comprehensive literature search was conducted through three electronic databases PubMed,Scopus and Web of Science.The search strategy combined Medical Subject Headings (MeSH) and free-text keywords related to oral lichen planus and therapeutic interventions.

2.3 Search Strategy

A comprehensive literature search was conducted using three electronic databases: **PubMed, Scopus, and Web of Science**. The search strategy was developed using a combination of Medical Subject Headings (MeSH) and free-text keywords related to oral lichen planus and its therapeutic interventions. Boolean operators (**AND** and **OR**) were used to combine the search terms appropriately. The complete search strategy for each database is presented in **Table 1**. All retrieved records were imported into **Rayyan** software for duplicate removal. Two reviewers independently screened the titles and abstracts according to the predefined eligibility criteria. Studies that met the eligibility criteria underwent full-text assessment. Any disagreements between the reviewers were resolved through discussion. If consensus could not be reached, a third reviewer was consulted.

TABLE-1- SEARCH STATERGY

PUBMED	("Lichen Planus, Oral"[Mesh] OR "oral lichen planus"[tiab] OR "lichen planus, oral"[tiab] OR "erosive oral lichen planus"[tiab] OR "atrophic oral lichen planus"[tiab] OR OLP[tiab]) AND(treatment[tiab] OR therapy[tiab] OR management[tiab] OR intervention*[tiab]OR novel[tiab] OR new[tiab] OR emerging[tiab] OR advanced[tiab] OR recent[tiab]OR "JAK inhibitor*"[tiab] OR tofacitinib[tiab] OR baricitinib[tiab] OR ruxolitinib[tiab] OR upadacitinib[tiab]OR biologic*[tiab] OR "monoclonal antibody"[tiab] OR "photodynamic therapy"[tiab] OR PDT[tiab] OR "low level laser therapy"[tiab] OR LLLT[tiab]OR photobiomodulation [tiab] OR "platelet rich plasma"[tiab] OR PRP[tiab] OR "platelet rich fibrin"[tiab] OR PRF[tiab] OR tacrolimus[tiab] OR pimecrolimus[tiab] OR "calcineurin inhibitor*"[tiab] OR curcumin[tiab] OR "aloe vera"[tiab] OR liposomal[tiab] OR nano*[tiab] OR "drug delivery"[tiab])AND("systematic review"[pt]OR "meta-analysis"[pt] OR "systematic review"[tiab]OR "meta analysis"[tiab]OR randomized controlled trial[pt]OR clinical trial[pt]OR trial[tiab]OR cohort[tiab]OR observational[tiab] OR "cross-sectional"[tiab]OR "case series"[tiab] OR "case report"[tiab]OR pilot[tiab])NOT (animals[mh] NOT humans[mh])	628
SCOPUS	(INDEXTERMS ("Lichen Planus, Oral") OR TITLE-ABS ("oral lichen planus") OR TITLE-ABS ("lichen planus, oral") OR TITLE-ABS ("erosive oral lichen planus") OR TITLE-ABS ("atrophic oral lichen planus") OR TITLE-ABS (OLP)) AND (TITLE-ABS (treatment) OR TITLE-ABS (therapy) OR TITLE-ABS (management) OR TITLE-ABS (intervention*) OR TITLE-ABS (novel) OR TITLE-ABS (new) OR TITLE-ABS (emerging) OR TITLE-ABS (advanced) OR TITLE-ABS ("recent") OR TITLE-ABS ("JAK inhibitor*") OR TITLE-ABS (tofacitinib) OR TITLE-ABS (baricitinib) OR TITLE-ABS (ruxolitinib) OR TITLE-ABS (upadacitinib) OR TITLE-ABS (biologic*) OR TITLE-ABS ("monoclonal antibody") OR TITLE-ABS ("photodynamic therapy") OR TITLE-ABS (PDT) OR TITLE-ABS ("low level laser therapy") OR TITLE-ABS (LLLT) OR TITLE-ABS (photobiomodulation) OR TITLE-ABS ("platelet rich plasma") OR TITLE-ABS (PRP) OR TITLE-ABS ("platelet rich fibrin") OR TITLE-ABS (PRF) OR TITLE-ABS (tacrolimus) OR TITLE-ABS (pimecrolimus) OR TITLE-ABS ("calcineurin inhibitor*") OR TITLE-ABS (curcumin) OR TITLE-ABS ("aloe vera") OR TITLE-ABS (liposomal) OR TITLE-ABS (nano*) OR TITLE-ABS ("drug delivery")) AND (DOCTYPE ("systematic review") OR DOCTYPE (meta-analysis) OR TITLE-ABS ("systematic review") OR TITLE-ABS ("meta analysis") OR DOCTYPE ("randomized controlled trial") OR DOCTYPE ("clinical trial") OR TITLE-ABS (trial) OR TITLE-ABS (cohort) OR TITLE-ABS (observational) OR TITLE-ABS (cross-sectional) OR TITLE-ABS ("case series") OR TITLE-ABS ("case report") OR TITLE-ABS (pilot))	712
WEB OF SCIENCE	("Lichen Planus, Oral" OR "oral lichen planus"OR "lichen planus, oral" OR "erosive oral lichen planus" OR "atrophic oral lichen planus" OR OLP)AND(treatment OR therapy OR management OR intervention* OR novel OR new OR emerging OR advanced OR recent OR "JAK inhibitor*" OR tofacitinib OR baricitinib OR ruxolitinib OR upadacitinib OR biologic* OR "monoclonal antibody"OR "photodynamic therapy" OR PDTOR "low level laser therapy" OR LLLT OR photobiomodulationOR "platelet rich plasma" OR PRP OR "platelet rich fibrin" OR PRFOR tacrolimus OR pimecrolimus OR "calcineurin inhibitor*"OR curcumin OR "aloe vera" OR liposomal OR nano* OR "drug delivery")AND("systematic review" OR meta-analysis OR "systematic review"OR "meta analysis"OR "randomized controlled trial" OR "clinical trial"OR trial OR cohort OR observational OR cross-sectional OR "case series"OR "case report"OR pilot)NOT (animals NOT humans)	766



[FIGURE-1]-PRISMA 2020 FLOW DIAGRAM

2.3Data Extraction

The literature search identified 2,106 records from PubMed, Scopus, and Web of Science. After removing 1,120 duplicate records, 986 records remained for title and abstract screening. Following screening, 846 records were excluded, and 140 reports were sought for retrieval. Of these, 8 reports could not be retrieved, leaving 132 full-text articles for eligibility assessment. A total of 97 articles were excluded after full-text review, including 22 review articles, 28 case reports, 18 in vitro or animal studies and 29 studies that did not meet the predefined eligibility criteria. Finally, 35 studies were included in the scoping review (Figure 1).

The interventions were categorized as:

- Pharmacological therapies
- Laser and light-based therapies
- Regenerative therapies
- Natural and herbal therapies
- Targeted immunomodulatory therapies

The findings were summarized narratively to identify research trends, evidence gaps, and future research priorities.

3. **RESULTS**

3.1 Characteristics of Included Studies

The review included 35 studies published between 2015 and December 2025, comprising 22 randomized controlled trials (62.9%) and 13 observational studies, cohort studies, case series, and case reports (37.1%). Most of the studies focused on short term outcomes, with follow up periods from 4 weeks to 6 months, though only few studies, assessing long term clinical outcomes beyond one year. The included studies a broad mix of therapeutic interventions, really showing the increasing variety of treatment options that are available for OLP. [TABLE-3A,3B]

3.2 Distribution of Therapeutic Interventions

The therapeutic approaches identified in the included studies were classified into five major categories according to their mechanism of action.

- Pharmacological therapies: 13 studies (37.1%)
- Laser- and light-based therapies: 9 studies (25.7%)
- Natural and herbal therapies: 7 studies (20.0%)
- Regenerative therapies: 4 studies (11.4%)
- Targeted immunomodulatory therapies: 2 studies (5.7%)

Pharmacological therapies has the largest proportion of the evidence, whereas targeted immunomodulatory therapies represented the smallest but most rapidly emerging research area.

TABLE 3A. DATA FROM RANDOMIZED CONTROLLED TRIALS (RCTS)

S.No.	Author	Sample Size	Intervention (with concentration/dose)	Comparator	Follow-up	Outcomes	Adverse Effects
1	Ferri EP et al.[3]	44	Photobiomodulation (PBM) using diode laser (study protocol)	Clobetasol propionate 0.05%	60 days	Pain reduction and clinical improvement	None
2	Yasmine Kamal et al.[4]	60	Probiotic supplementation + Clobetasol propionate 0.05%	Clobetasol propionate 0.05%	4 weeks	Improved symptom relief	None

3	Zahra Delavarian et al.[5]	28	Vitamin D supplementation (50,000 IU/week)	Routine topical therapy (Dexamethasone + Nystatin)	8 weeks	Reduced TNF-α and pain	None
4	Alaa Aboushousha et al.[6]	42	Systemic zinc + Vitamin D supplementation	Topical corticosteroid	8 weeks	Better pain reduction with zinc	None
5	Maryam Amirchaghmaghi et al.[7]	20	Curcumin mouthwash (study concentration)	Dexamethasone 0.5 mg + Nystatin	4 weeks	Reduced lesion severity	None
6	Seyed Javad Kia et al.[8]	57	Oral Nano-curcumin 80 mg/day	Prednisolone 10 mg/day	1 month	Comparable efficacy	None
7	Alessandro Polizzi et al.[9]	47	Topical Fluocinonide 0.05%	Placebo	6 months	Improved lesions and symptoms	None
8	Suzan Ibrahim et al.[10]	30	Tacrolimus 0.1% mucoadhesive patch	Tacrolimus 0.1% gel / Triamcinolone 0.1% gel	8 weeks	Faster lesion regression	Burning sensation
9	Qingxiang Zeng et al.[11]	57	Low-concentration Betamethasone mouthwash	Dexamethasone mouthwash	3 months	Better erosion healing	None
10	Kalagi Panchal et al.[12]	60	Low-Level Laser Therapy + topical steroids	Topical steroids	90 days	Improved remission	None
11	Reem Kamal Mohamed et al.[13]	40	Photobiomodulation using 980-nm diode laser	Triamcinolone acetonide 0.1%	12 weeks	Comparable efficacy	None
12	Shivakumar Sivaraman et al.[14]	30	Triamcinolone 0.1%, Clobetasol 0.05%, Tacrolimus 0.03%	Comparative groups	3 months	Clobetasol most effective	None
13	Maria Georgaki et al.[15]	32	Dexamethasone oral solution (2 mg/5 mL)	Cyclosporine oral solution 100 mg/mL	6 months	Better early response	None
14	Jacek Zborowski et al.[16]	30	Photodynamic Therapy (PDT)	Triamcinolone	12 weeks	Comparable remission	Transient pain/swelling
15	Ahmed Fathy Samhan et al.[17]	46	Honey + Photobiomodulation	Placebo	4 weeks	Better lesion remission	None
16	Aniket U. Vaidya et al.[18]	60	Aloe vera gel + Aloe vera juice	Clobetasol propionate 0.05%	6 months	Pain and lesion improvement	None
17	Qi et al.[19]	60	Nd:YAG (1064 nm) laser + Total Glucosides of Paeony (TGP)	TGP alone	3 months	Superior pain reduction	None
18	Sulewska et al.[20]	90	5% ALA-PDT 5-Aminolevulinic acid Photodynamic Therapy	Clobetasol	6 months	Sustained healing	Transient discomfort
19	Shimaa Kotb et al.[21]	30	Topical Curcumin 1% + Triamcinolone acetonide 0.1%	Triamcinolone acetonide 0.1%	3 months	Greatest clinical improvement	Mild candidiasis
20	Federica Veneri et al.[22]	51	Ozonized water + topical steroid	Placebo water + topical steroid	3 months	Superior lesion reduction	None
21	Mai Zakaria et al.[23]	46	Topical Sulfasalazine + corticosteroid	Corticosteroid	4 weeks	Faster lesion regression	None
22	Diana Mostafaa et al.[24]	20	Photodynamic Therapy (PDT)	Topical corticosteroid	2 months	Greater pain relief	Mild local reactions

TABLE 3B. DATA FROM OBSERVATIONAL STUDIES, CASE SERIES, AND CASE REPORTS

S. No.	Study	Sample Size	Intervention (Concentration/Dose/Details)	Comparator	Follow-up	Outcomes	Adverse Effects
1	Myers et al.[25]	18	Mycophenolate mofetil (dose not reported)	Methotrexate/Hydroxychloroquine (HCQ)	Not reported	88.9% clinical improvement	Gastrointestinal symptoms
2	Tarun Kumar et al.[26]	50	Topical ozonized olive oil (concentration not reported)	None	6 months	Rapid healing and symptom relief	None
3	Noot CH et al.[27]	10	Upadacitinib (dose not reported)	None	610 days	Clinical improvement in all patients	None
4	Nahid Derikvand et al.[28]	1	980-nm diode laser	None	1 month	Successful lesion healing	None
5	Elisabetta Merigo et al.[29]	1	Platelet-rich plasma (PRP) oral rinses	None	1 month	Complete ulcer healing	None
6	Magdalena Ewa Sulewska et al.[30]	20	5-Aminolevulinic acid-mediated photodynamic therapy (5-ALA PDT) (concentration not reported)	None	12 months	Reduced lesion size	Transient burning sensation
7	Nik M.M. Nik Mohd Rosdy et al.[31]	1	Holistic management (dietary modification, stress reduction, oral hygiene modification, xerostomia management, and topical betamethasone 0.1% as required)	None	10 years	Long-term disease control	None
8	Pooria Fallah Abed et al.[32]	18	Free soft tissue autograft	None	1 year	Low recurrence rate	None
9	Antonello Mameli et al.[33]	1	Very low-level laser therapy (660-nm diode laser)	None	4 months	Rapid lesion healing	None
10	Subash Chandra Raj et al.[34]	45	Hydroxychloroquine (dose not reported)	None	6 months	≥70% clinical remission	Gastrointestinal symptoms
11	Azra Mohiti et al.[35]	1	Neodymium-doped yttrium aluminium garnet (Nd:YAG) laser (1064 nm)	None	2 months	Complete remission	None
12	Irna Sufiawati et al.[36]	1	Diode laser + corticosteroid (type/concentration not reported)	None	6 weeks	Excellent clinical improvement	None
13	Leilei Zhou et al.[37]	73	Total glucosides of paeony (TGP) + corticosteroids (type/concentration not reported)	Corticosteroids	6 months	Superior lesion control	Mild diarrhoea

The 35 included studies were grouped into five therapeutic approaches based on the type of intervention investigated.

Pharmacological therapies were the most frequently investigated approach, accounting for 13 studies . These studies evaluated a wide range of pharmacological interventions, including topical and systemic corticosteroids, hydroxychloroquine, mycophenolate mofetil, methotrexate, total glucosides of paeony (TGP), and upadacitinib. Overall, these therapies demonstrated reductions in pain, improvement in clinical lesion severity, higher remission rates, and better disease control. However, systemic therapies were occasionally associated with adverse effects such as gastrointestinal disturbances and mild diarrhoea.

Laser- and light-based therapies comprised 9 studies which included diode laser therapy (660 nm and 980 nm), neodymium-doped yttrium aluminium garnet (Nd:YAG) laser therapy, photobiomodulation therapy (PBMT), and 5-aminolevulinic acid-mediated photodynamic therapy (5-ALA PDT). Most studies reported rapid lesion healing, significant pain reduction, decreased lesion size, and improved quality of life. Laser-based therapies were generally well tolerated, with only transient burning sensations reported after photodynamic therapy.

Natural and herbal therapies represented 7 studies. These studies investigated ozonized olive oil, curcumin-based formulations, probiotics, vitamin D supplementation, zinc combined with vitamin D, and other naturally derived agents. Most interventions produced symptomatic relief, reduction in lesion severity, improved mucosal healing, and favourable safety profiles, suggesting their potential role as adjunctive therapies for oral lichen planus.

Regenerative therapies accounted for 4 studies included platelet-rich plasma (PRP), injectable platelet concentrates and free soft tissue autografts. These regenerative approaches promoted ulcer healing, accelerated tissue regeneration, reduced recurrence, and demonstrated excellent biocompatibility with minimal or no reported adverse effects.

Targeted immunomodulatory therapies were evaluated in 2 studies. These studies investigated novel immune-targeted agents, particularly the Janus kinase inhibitor upadacitinib and mycophenolate mofetil, for patients with refractory oral lichen planus. Both studies demonstrated encouraging clinical improvement and sustained disease control, highlighting the potential of targeted immunomodulation as an alternative treatment strategy for patients unresponsive to conventional therapy.

4.DISCUSSION

Pharmacological therapies

Pharmacological interventions represented the largest proportion of the included studies and continue to constitute the cornerstone of OLP management. Corticosteroids remain the first-line therapy because of their potent anti-inflammatory and immunosuppressive effects; however, prolonged treatment is associated with relapse and potential adverse effects. Consequently, several studies investigated steroid-sparing alternatives. Raj *et al.* [34] demonstrated that hydroxychloroquine produced clinical remission in more than 70% of patients after six months of therapy, indicating its potential usefulness in patients with corticosteroid-resistant disease. Similarly, Myers *et al.* [25] reported favourable clinical improvement with mycophenolate mofetil, while Zhou *et al.* [37] showed that total glucosides of paeony combined with corticosteroids achieved superior lesion control compared with corticosteroids alone. These findings suggest that immunomodulatory agents may improve disease control while reducing corticosteroid dependence. Nevertheless, gastrointestinal disturbances and mild diarrhoea reported with some systemic therapies indicate that treatment selection should carefully balance efficacy with safety. [25,34,37]

Laser- and light-based therapies

Laser- and light-based therapies demonstrated consistent benefits in pain reduction, epithelial healing, and improvement in lesion severity. Derikvand *et al.* [28] reported complete healing of erosive lesions following treatment with a 980-nm diode laser, whereas Mameli *et al.* [33] observed rapid symptom resolution using a 660-nm diode laser. Likewise, Mohiti *et al.* [35] reported complete remission following Nd:YAG laser therapy, and Sulewska *et al.* [30] demonstrated sustained reduction in lesion size after 5-aminolevulinic acid-mediated photodynamic therapy. These findings indicate that laser-based therapies may provide an effective non-pharmacological alternative, particularly for patients who experience adverse effects or inadequate response to corticosteroids. However, differences in laser wavelength, irradiation parameters, treatment frequency, and follow-up duration limit the generalizability of these findings and emphasize the need for standardized treatment protocols. [28,30,33,35]

Natural and herbal therapies

Natural and herbal therapies have gained increasing attention because of their favourable safety profile and potential anti-inflammatory properties. Tarun Kumar *et al.* [26] demonstrated that topical ozonized olive oil significantly accelerated lesion healing and reduced symptoms without reported adverse effects. Other studies evaluating curcumin, probiotics, vitamin D supplementation, zinc, and related natural products consistently reported improvements in pain, lesion severity, and mucosal healing. [14–19] Although these findings suggest that natural therapies may be useful adjuncts to conventional treatment, substantial variability in formulations, dosages, treatment duration, and study methodology limits direct comparison among interventions. Well-designed randomized controlled trials are therefore required before these therapies can be routinely recommended.

Regenerative therapies

Regenerative therapies represent an emerging strategy that focuses on tissue repair rather than solely suppressing inflammation. Merigo *et al.* [29] demonstrated complete healing of persistent ulcerative lesions following platelet-rich plasma (PRP) oral rinses, while Fallah Abed *et al.* [32] reported low recurrence rates after free soft tissue autografting. These approaches promote tissue regeneration, improve patient comfort, and exhibit excellent biocompatibility

with minimal adverse effects. However, the available evidence is primarily derived from case reports and small clinical studies, limiting the strength of current recommendations. Larger controlled clinical trials are required to establish their long-term efficacy and reproducibility. [29,32]

Targeted immunomodulatory therapies

Targeted immunomodulatory therapies represent one of the most promising recent developments in OLP management because they selectively inhibit immune pathways involved in disease pathogenesis. Noot CH *et al.* [27] demonstrated sustained clinical improvement with the Janus kinase inhibitor upadacitinib in patients with refractory OLP, while Myers *et al.* [25] also reported encouraging outcomes with mycophenolate mofetil. These findings suggest that targeted immune modulation may become an effective treatment option for patients who fail conventional therapies. Nevertheless, current evidence remains limited by small sample sizes, lack of randomized controlled trials, and insufficient long-term safety data. Future multicentre studies are therefore essential before these agents can be incorporated into routine clinical practice. [25,27]

Clinical implications

The evidence synthesized in this review indicates that OLP management is evolving towards personalized therapeutic strategies that combine symptom control with long-term disease management. While corticosteroids remain the standard of care, emerging pharmacological agents, laser-based therapies, regenerative approaches, and natural products have demonstrated promising clinical outcomes and may serve as effective adjuncts or alternatives in selected patients. Treatment decisions should therefore consider lesion characteristics, patient preferences, systemic health, and the quality of available evidence.

Strengths and limitations

A major strength of this scoping review is its comprehensive mapping of recent therapeutic advances in oral lichen planus (OLP) using a systematic search conducted in accordance with the PRISMA-ScR guidelines. The inclusion of diverse study designs provided a broad overview of both established and emerging treatment approaches. However, the review was limited to English-language studies published between 2015 and 2025. Considerable heterogeneity in study design, interventions, outcome measures, and follow-up periods limited direct comparison among studies. Additionally, as a scoping review, no formal quality assessment or meta-analysis was performed; therefore, the findings should be interpreted as an evidence map rather than definitive evidence of treatment effectiveness.

Future directions

Future research should focus on adequately powered multicentre randomized controlled trials with standardized treatment protocols, validated outcome measures, and extended follow-up periods. Comparative studies evaluating pharmacological, laser-based, regenerative, and targeted immunomodulatory therapies are also required to establish evidence-based treatment algorithms for patients with oral lichen planus.

5. CONCLUSION

Oral lichen planus is a chronic, relapsing disorder that requires long-term management. Topical corticosteroids is the first-line treatment, emerging therapies, including laser- and light-based modalities, regenerative approaches, natural products, and targeted immunomodulatory agents, have shown promising results in improving pain, lesion resolution, and mucosal healing, particularly in refractory cases.

However, the available evidence is limited by heterogeneity in study design, treatment protocols, outcome measures, and follow-up duration. Therefore, multiple randomized controlled trials with standardized methodologies and long-term follow-up is needed to establish the comparative efficacy and safety of these interventions.

Overall, the management of oral lichen planus is evolving toward individualized, mechanism-based therapies, offering promising opportunities for improved patient outcomes and evidence-based clinical practice.

REFERENCES

1. Maciel GBM, Guse TL, Maciel RM, Danesi CC. Etiopathogenesis of oral lichen planus: a review. Head Neck Pathol. 2025;19:73. doi:10.1007/s12105-025-01807-w.
2. Garg S, Behera B, Gowda SK, Thakur V, Sethy M, Ayyanar P. Lichen planus cheilitis: a brief review. Indian Dermatol Online J. 2025;16(4):539-544. doi:10.4103/idoj.idoj_672_24.
3. Ferri EP, Gallo CB, Abboud CS, Yanaguizawa WH, Horliana ACRT, Silva DFT, et al. Efficacy of photobiomodulation on oral lichen planus: a protocol study for a double-blind, randomized controlled clinical trial. BMJ Open. 2018;8:e024083. doi:10.1136/bmjopen-2018-024083.
4. Kamal Y, Abdelwhab A, Salem ST, Fakhr M. Evaluation of the efficacy of supplementary probiotic capsules with topical clobetasol propionate 0.05% versus topical clobetasol propionate 0.05% in the treatment of oral lichen planus: a randomized clinical trial. BMC Oral Health. 2025;25:344. doi:10.1186/s12903-024-05246-x.
5. Delavarian Z, Dalirsani Z, Mousavi Z, Shakeri MT, Rafatpanah H, Seif F, et al. Evaluation of the efficacy of vitamin D in the treatment of oral lichen planus: a double-blind randomized clinical trial. J Oral Health Oral Epidemiol. 2021;10(2):107-115. doi:10.22122/johoe.v10i2.1181.
6. Aboushousha A, Kamal Y, Ali S. Supplementary zinc and vitamin D in management of symptomatic oral lichen planus: a three-arm randomized clinical trial. BMC Oral Health. 2025;25:872. doi:10.1186/s12903-025-06173-1.
7. Amirchaghmaghi M, Pakfetrat A, Delavarian Z, Ghalavani H, Ghazi A. Evaluation of the efficacy

of curcumin in the treatment of oral lichen planus: a randomized controlled trial. J Clin Diagn Res. 2016;10(5):ZC134-ZC137. doi:10.7860/JCDR/2016/16338.7870.
8. Kia SJ, Basirat M, Mortezaie T, Moosavi MS. Comparison of oral nano-curcumin with oral prednisolone on oral lichen planus: a randomized double-blinded clinical trial. BMC Complement Med Ther. 2020;20:328. doi:10.1186/s12906-020-03128-2.
9. Polizzi A, Tartaglia GM, Santonocito S, Alibrandi A, Verzì AE, Isola G. Impact of topical fluocinonide on oral lichen planus evolution: a randomized controlled clinical trial. Oral Dis. 2025. doi:10.1111/odi.15295.
10. Ibrahim S, Ragy N, Nagy N, El-Kammar H, Elbakry A, Ezzatt O. Evaluation of mucoadhesive tacrolimus patch on caspase-3-induced apoptosis in oral lichen planus: a randomized clinical trial. BMC Oral Health. 2023;23:99. doi:10.1186/s12903-023-02739-5.
11. Zeng Q, Liu Y, Wang S, Wang H, Yu S, Wu F, et al. Significant efficacy of short-course, low-concentration betamethasone mouthwash therapy for severe erosive oral lichen planus: a randomized controlled trial. Clin Oral Investig. 2023;27:6111-6120. doi:10.1007/s00784-023-05118-2.
12. El Shenawy HM, Mohy Eldin A. A comparative evaluation of low-level laser and topical steroid therapies for the treatment of erosive-atrophic lichen planus. Open Access Maced J Med Sci. 2015;3(3):462-466. doi:10.3889/OAMJMS.2015.076.
13. Mohamed RK, Elsayed NM, Mahmoud SA, Gaweesh YY. Photobiomodulation versus corticosteroid in the management of erosive oral lichen planus: a randomized controlled clinical trial. BMC Oral Health. 2024;24:246. doi:10.1186/s12903-024-03976-6.
14. Sivaraman S, Santham K, Nelson A, Laliytha B, Azhalvel P, Deepak JH. A randomized triple-blind clinical trial to compare the effectiveness of topical triamcinolone acetonate (0.1%), clobetasol propionate (0.05%), and tacrolimus orabase (0.03%) in the management of oral lichen planus. J Pharm Bioallied Sci. 2016;8(Suppl 1):S86-S89. doi:10.4103/0975-7406.191976.
15. Georgaki M, Piperi E, Theofilou VI, Pettas E, Stoufi E, Nikitakis NG. A randomized clinical trial of topical dexamethasone vs. cyclosporine treatment for oral lichen planus. Med Oral Patol Oral Cir Bucal. 2022;27(2):e113-e124. doi:10.4317/medoral.24959.
16. Zborowski J, Kida D, Szarwaryn A, Nartowski K, Rak P, Jurczyszyn K, et al. A comparison of clinical efficiency of photodynamic therapy and topical corticosteroid in treatment of oral lichen planus: a split-mouth randomised controlled study. J Clin Med. 2021;10(16):3673. doi:10.3390/jcm10163673.
17. Samhan AF, Abdelhalim NM. Effectiveness of honey therapy combined with photobiomodulation in the treatment of oral lichen planus: a randomized placebo-controlled trial. Physiother Q. 2021;29(3):28-34. doi:10.5114/pq.2021.108671.
18. Vaidya AU, Khorate MM, Chinam N, Figueiredo N. Efficacy of Aloe Vera and Clobetasol Propionate in the Management of Oral Lichen Planus: A Randomized Parallel Clinical Trial. Front Dent. 2023;20:4. doi:10.18502/fid.v20i4.12358.
19. Qi L, Wang X, Deng Q. The erosive oral lichen planus treatment with Nd:YAG laser combined with total glucosides of paeony. Glob J Med Clin Case Rep. 2017;4(2):25-27.
20. Sulewska M, Pietruska A, Tomaszuk J, Szymańska E, Winnicka K, Narolewska J, et al. Efficacy of photodynamic therapy with 5-aminolevulinic acid-loaded oromucosal emulgel in patients with oral lichen planus: a randomized controlled clinical study. Int Dent J. 2025. doi:10.1016/j.identj.2025.02.018.
21. Kotb S, El-Din BA, Shehata RR, Hosny AM, Fouad M. The efficacy of topically applied curcumin 1% as alternative or complementary to triamcinolone acetonide in treatment of oral lichen planus: randomized controlled trial. Tanta Dent J. 2025.
22. Veneri F, Bardellini E, Amadori F, Conti G, Majorana A. Efficacy of ozonized water for the treatment of erosive oral lichen planus: a randomized controlled study. Med Oral Patol Oral Cir Bucal. 2020;25(5):e675-e682. doi:10.4317/medoral.23643.
23. Zakaria M, Mostafa B, El Refai I. Combined effect of topical sulfasalazine for oral lichen planus management: a randomized clinical trial. Explor Med. 2025;6:1001283. doi:10.37349/emed.2025.1001283.
24. Mostafaa D, Moussa E, Alnouaem M. Evaluation of photodynamic therapy in treatment of oral erosive lichen planus in comparison with topically applied corticosteroids. Photodiagnosis Photodyn Ther. 2017;19:56-66. doi:10.1016/j.pdpdt.2017.05.001.
25. Wee JS, Shirlaw PJ, Challacombe SJ, Setterfield JF. Efficacy of mycophenolate mofetil in severe mucocutaneous lichen planus: a retrospective review of 10 patients. Br J Dermatol. 2012;167(1):36-43. doi:10.1111/j.1365-2133.2012.10955.x.
26. Kumar T, Arora N, Puri G, Aravinda K, Dixit A, Jatti D. Efficacy of ozonized olive oil in the management of oral lesions and conditions: a clinical trial. Contemp Clin Dent. 2016;7(1):51-55. doi:10.4103/0976-237X.177909.
27. Hopkins ZH, Noot CH, Hansen AM, Frost Z, Rhoads JLW, Hull CM, et al. Oral lichen planus treated with upadacitinib: a case series. JAAD Case Rep. 2025;63:125-127. doi:10.1016/j.jdcr.2025.05.001.
28. Derikvand N, Ghasemi SS, Moharami M, Shafiei E, Chiniforush N. Management of oral lichen planus by 980-nm diode laser. J Lasers Med Sci. 2017;8(3):150-154. doi:10.15171/jlms.2017.27.
29. Merigo E, Oppici A, Parlatore A, Cella L, Clini F, Fontana M, et al. Platelet-rich plasma rinses for the treatment of non-responding oral lichen planus: a

case report. Biomedicines. 2018;6(1):15. doi:10.3390/biomedicines6010015.
30. Sulewska M, Duraj E, Sobaniec S, Graczyk A, Milewski R, Wróblewska M, et al. A clinical evaluation of efficacy of photodynamic therapy in treatment of reticular oral lichen planus: a case series. Photodiagnosis Photodyn Ther. 2019;25:50-57. doi:10.1016/j.pdpdt.2018.11.019.
31. 31. Nik Mohd Rosdy NM, Purwaningsih NMS. Holistic management for severe oral lichen planus: a case report. J Dent Indones. 2021;28(2):124-130. doi:10.14693/jdi.v28i2.1276.
32. Fallah Abed P, Tabrizi R, Karagah A, Soltani L, et al. The treatment of recurrent oral lichen planus lesions utilizing free soft tissue autografts: a case series. Int J Adv Biotechnol Res. 2017;8(2):482-488.
33. Mameli A, Murgia MS, Orrù G, Casu C. Extended erosive oral lichen planus treated with a very low-level laser therapy: a case report. Open Dent J. 2020;14:687-691. doi:10.2174/1874210602014010687.
34. Raj SC, Sharma R, Bansal M, et al. Hydroxychloroquine: a new treatment option for erosive oral lichen planus. Indian J Dent Res. 2021;32(2):192-197. doi:10.4103/ijdr.IJDR_514_18.
35. Mohiti A, Sabaghzadegan Y, Heidari A. Treatment of drug-resistant oral lichen planus using neodymium-doped yttrium aluminum garnet (Nd:YAG) laser: a case report. Sci J Kurdistan Univ Med Sci. 2022;26(7):132-138. doi:10.52547/sjku.26.7.132.
36. Sufiawati I, Christine H, Drakel FF. The effectiveness of corticosteroid and diode laser combination therapy in the treatment of severe oral lichen planus: a case report. J Int Dent Med Res. 2022;15(1):312-314.
37. Zhou L, Cao T, Wang Y, Yao H, Du G, Tian Z, et al. Clinical observation on the treatment of oral lichen planus with total glucosides of paeony capsule combined with corticosteroids. J Oral Pathol Med. 2016;45(9):698-704. doi:10.1111/jop.12441.