# Turmeric-based Oral Rinses In Oral Mucositis Management: Advances, Mechanisms, And Challenges

## Enxaguantes Orais à Base de Cúrcuma no Tratamento da Mucosite Oral: Avanços, Mecanismos e Desafios

## Enjuagues Orales de Cúrcuma En El Tratamiento de La Mucositis Oral: Avances, Mecanismos y Retos

**RESUMO**

**Objetivo:** avaliar a eficácia dos enxaguantes orais à base de cúrcuma/curcumina na prevenção e redução da mucosite oral em pacientes submetidos à quimio-radioterapia.

**Métodos:** realizou-se uma busca sistemática em diferentes bases de dados e literatura cinzenta, considerando estudos publicados entre 2014 e outubro de 2024. Foram selecionados ensaios clínicos e revisões da literatura que investigaram a eficácia dos enxaguantes orais contendo curcumina, excluindo estudos com outras formulações, como cápsulas e géis.

**Resultados e Conclusão:** quatorze estudos foram incluídos. Os resultados indicam que os enxaguantes com curcumina retardam o aparecimento da mucosite e reduzem sua gravidade, embora não previnam completamente sua incidência. Esses enxaguantes são seguros, de fácil aplicação e bem tolerados. No entanto, limitações metodológicas foram observadas nesses estudos, como amostras reduzidas e variabilidade nas dosagens. Ensaios clínicos robustos são necessários para validar esses achados e otimizar a biodisponibilidade da curcumina, trazendo maior eficácia no tratamento da mucosite oral.

**DESCRITORES:** Curcuma; Curcumina; Estomatite; Antissépticos Bucais; Quimiorradioterapia.

**ABSTRACT**

**Objective:** to evaluate the effectiveness of turmeric/curcumin-based oral rinses in preventing and reducing oral mucositis in patients undergoing chemo-radiotherapy. **Methods:** we conducted a systematic search across major databases covering studies published from 2014 to October 2024. Randomized clinical trials and literature reviews evaluating the efficacy of curcumin-based oral rinses were selected. Studies using different turmeric formulations (capsules, gels, or combinations with other compounds) were excluded. **Results and Conclusion:** fourteen studies were included. Findings suggest that curcumin-based oral rinses delay the onset of mucositis and reduce its severity, although they do not entirely prevent its occurrence. These rinses are safe, easy to use, and well-tolerated. However, methodological limitations were identified, such as small sample sizes and dosage variability. More robust clinical trials are necessary to validate these findings and improve curcumin bioavailability to enhance its effectiveness in oral mucositis treatment.

**DESCRIPTORS:** Curcuma; Curcumin; Stomatitis; Mouthwash; Chemoradiotherapy.

**RESUMEN**

**Objetivo:** evaluar la eficacia de los enjuagues orales con cúrcuma/curcumina en la prevención y reducción de la mucositis oral en pacientes sometidos a quimiorradioterapia. **Métodos:** se realizó una búsqueda sistemática en bases de datos y literatura gris, considerando estudios publicados entre 2014 y octubre de 2024. Se seleccionaron ensayos clínicos y revisiones sobre la eficacia de los enjuagues con curcumina, excluyendo otras formulaciones. **Resultados y conclusión:** se incluyeron 14 estudios, que indicaron que los enjuagues con curcumina retrasan la mucositis y reducen su gravedad, aunque no previenen totalmente su incidencia. Son seguros, fáciles de aplicar y bien tolerados. Sin embargo, los estudios presentan limitaciones metodológicas, como muestras pequeñas y variabilidad en las dosis. Se requieren ensayos clínicos más robustos para confirmar estos hallazgos y optimizar la biodisponibilidad de la curcumina, mejorando su eficacia en el tratamiento de la mucositis oral.

**DESCRIPTORES:** Curcuma; Curcumina; Estomatitis; Antisépticos Bucales; Quimioradioterapia.

**RECEIVED:** 02/07/2025 **APPROVED:** 02/20/2025

**How to cite this article:** Oliveira MMC, Filho IA, Rêgo ACM. Turmeric-based Oral Rinses In Oral Mucositis Management: Advances, Mechanisms, And Challenges. Saúde Coletiva (Edição Brasileira) [Internet]. 2025 [acesso ano mês dia];15(93):14888-14894 Disponível em: DOI: 10.36489/saudecoletiva.2025v15i93p14888-14894

**Márcia Marillac Cardoso Oliveira**
Dentist and Master's student in the Graduate Program in Biotechnology at Universidade Potiguar.
ORCID: https://orcid.org/0000-0000-0000-0000

**Irami Araújo Filho**
Medical Doctor, Ph.D. in Health Sciences from UFRN, and Ph.D. in Experimental Surgery from Sorbonne University/Paris Diderot. Professor of the Professional Master's/Doctorate Program in Biotechnology at Universidade Potiguar/Ânima Educação.
ORCID: https://orcid.org/0000-0003-2471-7447

**Amália Cinthia Meneses Rêgo**
Pharmacist, Ph.D. in Health Sciences from UFRN. Coordinator and Professor of the Professional Master's/Doctorate Program in Biotechnology at Universidade Potiguar/Ânima Educação.
ORCID: https://orcid.org/0000-0002-0575-3752

## INTRODUCTION

Oral mucositis (OM) is a common inflammatory condition affecting cancer patients undergoing radiotherapy and chemotherapy. It manifests as painful erythema, erosions, and ulcerations in oral tissues, leading to significant discomfort and weight loss [1]. Additionally, OM can result in systemic complications by increasing the risk of opportunistic and secondary infections [2].

An estimated 80% of patients receiving radiotherapy for head and neck cancers will develop some degree of OM, with more than 50% of cases classified as moderate to severe (grades 3 and 4) [3].

This condition severely impacts the quality of life and adherence to oncological treatments, as its severe forms often render patients unable to tolerate therapy. Moreover, the economic burden is substantial, as the costs of treating symptoms, providing nutritional support, managing secondary infections, and hospitalizations increase significantly [4].

According to Sonis [5], the additional cost associated with treating radiation-induced OM in head and neck cancer patients can reach up to $17,000 per patient. This financial burden significantly affects healthcare systems and patients, emphasizing the need to develop more effective and accessible therapies to alleviate this economic impact and enhance patient care. Currently, there is no universally accepted standard for OM treatment. The most common clinical management strategies include standardized oral care, anti-inflammatory agents, antimicrobials, analgesics, and topical agents [6-7].

Despite extensive research on various therapeutic agents and palliative measures, no single preventive or treatment protocol has proven entirely effective for OM [8]. Consequently, the search for alternative therapies, particularly those involving natural compounds, is gaining traction due to their potentially lower risk of adverse effects and toxicity than conventional treatments [9].

In this context, turmeric (Curcuma longa), a ginger family (Zingiberaceae) medicinal herb, has gained attention for its antioxidant, analgesic, anti-inflammatory, antiseptic, antimicrobial, and anticancer properties [10].

Curcumin, the primary bioactive pigment extracted from Curcuma longa rhizomes, is widely recognized for its therapeutic benefits. This natural polyphenol is one of the most extensively investigated compounds due to its broad biological effects, including anti-inflammatory and antioxidant activities [11].

Rao et al. [12] showed that turmeric-based mouthwash effectively delayed the onset and reduced the severity of radiation-induced OM. Since then, curcumin has been the focus of many clinical studies to explore its potential in OM prevention and symptom relief.

Given this background, the present study is an integrative review designed to evaluate the scientific literature on the efficacy of turmeric/curcumin-based oral rinses for preventing and mitigating OM in cancer patients undergoing chemo-radiotherapy. This review aims to provide an updated understanding of the topic and contribute to developing new therapeutic approaches.

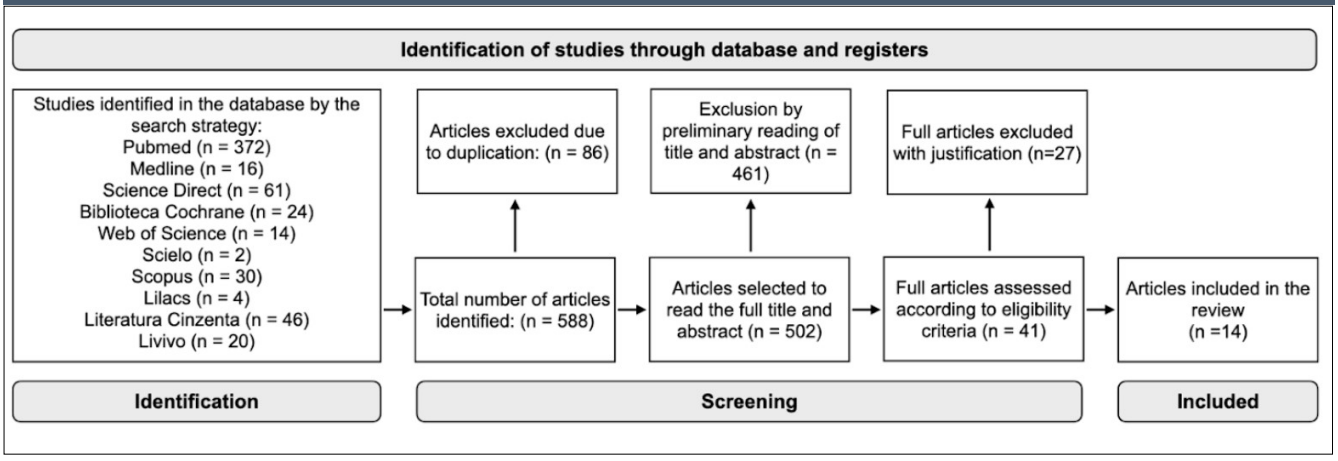
## METHODOLOGY

This integrative review explored the current evidence on turmeric/curcumin-based mouthwash for managing oral mucositis in patients undergoing radiotherapy and chemotherapy. We conducted a systematic search across major databases covering studies published from 2014 to October 2024. The search strategy included keywords: turmeric OR curcumin AND "oral mucositis" OR mucositis OR stomatitis AND mouthwash OR mouth rinse OR "oral rinse." Randomized clinical trials and literature reviews were included.

We used Rayyan to remove duplicate references to ensure accuracy. Two independent reviewers screened studies, with a third resolving disagreements. Full-text articles meeting the criteria were reviewed, resulting in 14 selected studies. We included research evaluating the efficacy of turmeric/curcumin-based mouthwash compared to placebo or other treatments and excluded studies on non-mouthwash curcumin formulations or combinations with other compounds. PRISMA guidelines ensured a transparent selection process (Figure 1).

DOI: https://doi.org/10.36489/saudecoletiva.2025v15i93p14888-14894

**Figure 1. PRISMA Diagram.**




Adapted from: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n7

## RESULTS

We identified 14 studies after performing the selection method. Table 1 lists the Clinical Trials and Table 2 shows the review studies.

**Table 1. Main points covered in Clinical Trial studies.**

| | | | | | | |
|---|---|---|---|---|---|---|
| Study Limitations | | Small sample, short 5-day duration, single-center study, subjective OM and pain assessment. | Small sample, single-center, no blinding in the turmeric group, no pain or quality of life assessments. | Small sample, high loss to follow-up, dropout rate affected reliability, results influenced by MO's self-limiting nature and radiotherapy dose response. | Insufficient details about blinding. | Small sample size. Confounding factors (radiation site/dose) affecting OM severity |
| Results and Conclusions | | Turmeric Mouthwash: Reduced OM severity Saline Mouthwash: Also reduced OM Comparison: Significant difference on days 4 and 5. | Turmeric: Delayed and reduced OM severity, fewer intolerable cases (14/39), and less weight loss. | Curcumin Mouthwash: Delayed OM onset, similar efficacy to benzydamine in preventing severe OM, well tolerated. Average Start off OM 7 days (benzydamine), 21 days (curcumin), with a 50% lower risk in the curcumin group | Turmeric mouthwash was more effective in reducing OM severity than benzydamine mouthwash | Curcumin reduced severity/burning vs. placebo. By the study's end, 33% (mouthwash) and 15% (nanocapsules) were ulcer-free; all placebo-developed OM. Pain and WHO scores were similar. |
| Intervention Characteristics | Control | Saline solution (0.9 g/100 mL water), rinse 50mL 3x/day for 5 days. | Povidone-iodine mouthwash. Rinse 10 mL 2x/ day for 7 weeks. | *Benzydamine 0.15% mouthwash. 10 mL 3 x/ day for 6 to 7 weeks.* | *Benzydamine Mouthwash* | *Placebo Mouthwash (10 mL 3 x/day for 21 days).* |
| | Intervention | Turmeric mouthwash (1.5 g/50 mL water), rinse 50 mL 3×/day for 5 days. | Turmeric mouthwash (400 mg/80 mL water), rinse 10 mL 6×/day for 7 weeks. | *Nanocurcumin 0.1% mouthwash. 10 mL mouthwash 3x/day for 6 to 7 weeks.* | *Turmeric mouthwash (400 mg/80 mL water), gargle 6×/day for 7 weeks.* | *Rinse with curcumin 0.1% (10 mL, 3×/day, 21 days) + nanocapsule (40 mg/day, up to 21 days).* |


DOI: https://doi.org/10.36489/saudecoletiva.2025v15i93p14888-14894

| Sample | 40 patients | 79 patients | 17 patients | 88 patients ( | 45 patients |
|---|---|---|---|---|---|
| Study | Non-Randomized Clinical Trial | Randomized Clinical Trial | Triple-blind Randomized Clinical Trial | Randomized Clinical Trial | Single-blind, randomized, controlled clinical trial |
| Author /Year | Saldanha, 2014 [13] | Rao et al., 2014 [12] | Shah et al., 2020 [14] | Thomas et al., 2023 [15] | Ramezani et al., 2023[16] |

**Table 2. Main points covered in Review-type studies**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Limitations of the Study | High variability in study design, interventions, outcomes, treatments, dosages, controls, and follow-ups. Small sample size and limited RCTs. | Small samples, moderate methodological quality, and potential bias. | Limited human applicability (mainly animal studies). More trials are needed for dose, route, and safety. Low oral bioavailability reduced efficacy. | Limited to specific patient groups. Further research needed in diverse populations. High variability in dose, duration, design, and formulation. | Need for well-designed, high-quality, large-scale RCTs. Few studies. A small number of patients tested, making it difficult to be certain of the results. Influence of chemotherapy regimens not considered. | High heterogeneity in formulations, concentrations and evaluation criteria. Low number of studies. Lack of detailed information on chemotherapy/ radiotherapy received and other side effects. | Need for more blinded randomized clinical trials. Small sample sizes limit conclusions about efficacy. | Confounding factors, such as radiation site and dose, that affect the severity of OM. | Non-uniform methods of administration and doses of curcumin in clinical trials. Lack of consistent assessment criteria for OM across studies. Inclusion of only six small samples from randomized clinical trials in the article. |
| Therapeutic Results | Delays onset of OM. Reduces severity Reduces pain score | Prevents Severe OM | Nanoformulations improve bioavailability. Nanoformulations improve bioavailability | Reduces the severity of OM. They are safe and well tolerated | Efficacy was greater than placebo (P<0.05). | Reduces pain and severity of OM, significantly decreasing erythema and ulcer size. | Reduces the severity of OM. Reduces the pain score Promotes the healing of ulceration | Reduces the severity of OM. Reduces Pain Score Reduces weight loss by improving symptoms such as dysphagia | Reduces the incidence of severe OM. Reduces weight loss by improving symptoms such as dysphagia |
| Study design | Systematic Review with Meta-Analysis | Systematic Review with Meta-Analysis | Integrative Review | Integrative Review | Systematic Review with Meta-Analysis | Systematic Review | Systematic Review | Systematic Review with Meta-Analysis | Systematic Review with Meta-Analysis |
| References | Dharma, 2021[17] | Zhang et al., 2020[18] | Akbari et al. 2020[19] | Hegde et al., 2023[20] | Yu et al. 2020 [21] | Normando et al., 2019 [22] | Wahyuni et al. 2021 [23] | Wu et al. 2024 [24] | Zhang; Tang; Wei, 2021 [25] |

## DISCUSSION

Neoadjuvant radiotherapy (RT), alone or in combination with chemotherapy (CT), improves cancer patient survival but often induces oral mucositis (OM), a major clinical challenge [26-27]. The World Health Organization (WHO) [28] classifies OM severity from grade 0 (intact mucosa) to grade 4 (severe ulcers and intense pain).

RT and CT cause direct genetic damage, leading to DNA strand breaks, apoptosis of basal epithelial cells, and reactive oxygen species production, activating nuclear factor kappa B (NF-kB). NF-kB regulates

DOI: https://doi.org/10.36489/saudecoletiva.2025v15i93p14888-14894

pro-inflammatory cytokines and adhesion proteins, playing a key role in OM pathogenesis. Curcumin, turmeric's primary active compound, has emerged as a promising therapeutic due to its ability to inhibit NF-kB activation, suppress pro-inflammatory cytokines like TNF-α, IL-6, and IL-8, and exhibit antibacterial properties, preventing bacterial adhesion in OM models [29-31].

We conducted a comprehensive analysis of studies published up to October 2024 to address this topic. The findings indicate that the topical application of curcumin on mucosal surfaces represents a promising treatment strategy, as it delays the onset of oral mucositis and reduces its severity, even though it does not entirely prevent the condition. The formulation in mouthwash has advantages due to its ease of application, practicality, and good patient tolerability [15-18, 22,24].

Despite these pharmacological benefits, curcumin faces challenges related to its therapeutic efficacy due to its limited bioavailability, low solubility in aqueous solutions, and rapid metabolism [32]. Different formulations, such as micelles, nanoparticles, liposomes, and solid dispersions, have been explored in vitro and in vivo to enhance curcumin bioavailability in clinical studies [20].

Most studies investigating curcumin's anti-inflammatory effects have shown promising results. However, these findings should be interpreted cautiously due to the high heterogeneity among studies. Variations in curcumin dosages and differences in control groups, which applied distinct therapeutic approaches, complicate the direct comparison of results. Furthermore, the small sample sizes in many studies limit the generalizability of the findings [14, 17, 19, 21].

Including both randomized and non-randomized clinical trials also increases the risk of bias, which can affect the quality of the evidence. The patient response to radiotherapy, influenced by the radiation dose received and the self-limiting nature of OM, contributes to variability in outcomes [14]. Other confounding factors include the radiation site and applied dose, directly impacting treatment efficacy [16].

Limited curcumin bioavailability remains a significant challenge, hindering its clinical application. Its low solubility and rapid metabolism in the body restrict absorption, reducing its therapeutic efficacy, especially in short-term treatments where fast results are required [33].

Recent research has focused on improving curcumin formulations to address these limitations. One promising approach is bio-enhanced formulations, which combine curcumin with other curcuminoids. These formulations have yielded positive results in reducing OM severity, dysphagia, and pain [34]. Additionally, using nanoformulations of curcumin in mouthwashes has demonstrated greater efficacy, indicating new possibilities for treatment [14].

Future multicenter studies with standardized and innovative curcumin formulations are essential to strengthening the evidence regarding its efficacy in OM treatment. Well-designed clinical trials with rigorous variable control are necessary to minimize bias risks. The adoption of strict methodological criteria is crucial to ensuring comparability across studies. Precise study protocols and adequate standardization can achieve a more reliable assessment of curcumin's impact on oral mucositis prevention and treatment.

## CONCLUSION

This review's results demonstrate the efficacy of turmeric-based mouthwash in preventing and reducing the severity of oral mucositis in cancer patients undergoing chemoradiotherapy. However, to strengthen the reliability and applicability of these studies, high-quality randomized, double-masked clinical trials must be conducted. These studies should include larger samples to increase representativeness and minimize statistical errors. In addition, rigorous control of variables such as radiation time, application location, curcumin doses administered, use of placebo, and blinding is necessary to avoid bias.

A more extended follow-up period is also recommended to assess long-term effects. Different methods should be investigated to determine their treatment effectiveness, which is essential to ensure more consistent clinically relevant results. In addition, it is essential to develop new curcumin formulations that minimize the challenges of its bioavailability and reduce adverse effects. In this context, nanoformulation of curcumin appears to be a promising strategy, capable of increasing its bioavailability and reducing its rapid degradation in the body.

Finally, a rigorous cost-benefit study, with logistical feasibility and access analyses, could better support introducing this type of product in Public or Private Health Systems. Such studies would allow us to assess the economic viability of using curcumin and expand its reach and accessibility, especially for populations with lower purchasing power. This economic viability could represent a significant advance in providing more effective, low-cost therapies for treating OM.


DOI: https://doi.org/10.36489/saudecoletiva.2025v15i93p14888-14894

## REFERÊNCIAS

1. Sio TT, Le-Rademacher JG, Leenstra JL, Loprinzi CL, Rine G, Curtis A, et al. Effect of Doxepin Mouthwash or Diphenhydramine-Lidocaine-Antacid Mouthwash vs Placebo on Radiotherapy-Related Oral Mucositis Pain: The Alliance A221304 Randomized Clinical Trial. JAMA. 2019;321(15):1481-1490.

2. Braga FTMM, Santos ACF, Bueno PCP, Silveira RCCP, Santos CB, Bastos JK, et al. Use of Chamomilla recutita in the Prevention and Treatment of Oral Mucositis in Patients Undergoing Hematopoietic Stem Cell Transplantation. Cancer Nurs. 2015;38(4):322-329.

3. de Vries J, Poelman A, Sidorenkov G, Festen S, de Bock GH, Langendijk JA, et al. The association of frailty and outcomes of geriatric assessment with acute radiation-induced toxicity in patients with head and neck cancer. Oral Oncol.2022;130:105933.

4. Niikura N, Ota Y, Hayashi N, Naito M, Kashiwabara K, Watanabe K, et al. Evaluation of oral care to prevent oral mucositis in estrogen receptor-positive metastatic breast cancer patients treated with everolimus (Oral Care-BC): randomized controlled phase III trial. Jpn J Clin Oncol. 2016;46(9):879-82.

5. Sonis ST. Mucositis: The impact, biology and therapeutic opportunities of oral mucositis. Oral Oncol. 2009;45(12):1015-20.

6. Galloway T, Amdur RJ. Management and prevention of complications during initial treatment of head and neck cancer: UptoDate. 2024out. https://medilib.ir/uptodate/show/3408.

7. Armelin MVL, Jurado SR, Saraiva KVO, Corazza AV, Silva GD, Sanchez A. O uso do laser de baixa potência por enfermeiro no tratamento de lesões cutâneas e orais. Nursing (São Paulo). 2019;22(253):3006-10.

8. dos Santos Filho EX, da Silva ACG, de Ávila RI, Batista AC, Marreto RN, Lima EM, et al. Chemopreventive effects of FITOPROT against 5-fluorouracil-induced toxicity in HaCaT cells. Life Sci. 2018; 193:300-8.

9. Baharvand M, Jafari S, Mortazavi H. Herbs in Oral Mucositis. J Clin Diagn Res. 2017;11(3):ZE05-ZE11.

10. Huang X, Zheng Y, Zhang X, Mai H, Zeng L, Liu X, et al. Diagnosis and Management of Skull Base Osteoradionecrosis After Radiotherapy for Nasopharyngeal Carcinoma. Laryngoscope. 2006;116(9):1626-31.

11. Nagpal M, Sood S. Role of curcumin in systemic and oral health: An overview. J Nat Sci Biol Med. 2013; 4(1): 3-7

12. Rao S, Dinkar C, Vaishnav LK, Rao P, Rai MP, Fayad R, et al. The Indian Spice Turmeric Delays and Mitigates Radiation-Induced Oral Mucositis in Patients Undergoing Treatment for Head and Neck Cancer. Integr Cancer Ther. 2014;13(3):201-10.

13. Saldanha SP. A Comparative Study to Assess the Effectiveness of Turmeric Mouth Wash versus Saline Mouth Wash on Treatment Induced Oral Mucositis (Tiom) in a Selected Hospital at Mangalore. J Clin Res Bioeth. 2014;5(6).

14. Shah S, Rath H, Sharma G, Senapati SN, Mishra E. Effectiveness of curcumin mouthwash on radiation-induced oral mucositis among head and neck cancer patients: A triple-blind, pilot randomised controlled trial. Indian J Dent Res. 2020;31(5):718-27.

15. Thomas PL, Kang HK, Rishi KS. Randomized Control Study of the Effects of Turmeric Mouthwash on Oral Health Status, Treatment-Induced Mucositis, and Associated Oral Dysfunctions Among Patients with Head and Neck Cancer. Cancer Nurs. 2023;46(1):36-44.

16. Ramezani V, Ghadirian S, Shabani M, Boroumand MA, Daneshvar R, Saghafi F. Efficacy of curcumin for amelioration of radiotherapy-induced oral mucositis: a preliminary randomized controlled clinical trial. BMC Cancer. 2023;23(1):354.

17. Dharman S, G Marahathavalli, Shanmugasundaram K, Sampath RK. A Systematic Review and Meta-Analysis on the Efficacy of Curcumin/Turmeric for the Prevention and

DOI: https://doi.org/10.36489/saudecoletiva.2025v15i93p14888-14894

Amelioration of Radiotherapy/Radiochemotherapy Induced Oral Mucositis in Head and Neck Cancer Patients. Asian Pac J Cancer Prev. 2021;22(6):1671-84.

18. Zhang X, Sun D, Qin N, Liu M, Zhang J, Li X. Comparative prevention potential of 10 mouthwashes on intolerable oral mucositis in cancer patients: A Bayesian network analysis. Oral Oncol. 2020; 107:104751.

19. Akbari S, Kariznavi E, Jannati M, Elyasi S, Tayarani-Najaran Z. Curcumin as a preventive or therapeutic measure for chemotherapy and radiotherapy induced adverse reaction: A comprehensive review. Food Chem Toxicol. 2020; 145:111699.

20. Hegde M, Girisa S, BharathwajChetty B, Vishwa R, Kunnumakkara AB. Curcumin Formulations for Better Bioavailability: What We Learned from Clinical Trials Thus Far? ACS Omega. 2023;8(12):10713-46.

21. Yu YT, Deng JL, Jin XR, Zhang ZZ, Zhang XH, Zhou X. Effects of 9 oral care solutions on the prevention of oral mucositis: a network meta-analysis of randomized controlled trials. Medicine (Baltimore). 2020;99(16):e19661.

22. Normando AGC, de Menêses AG, de Toledo IP, Borges GÁ, de Lima CL, Dos Reis PED, et al. Effects of turmeric and curcumin on oral mucositis: A systematic review. Phytother Res. 2019;33(5):1318-29.

23. Wahyuni IS, Sufiawati I, Nittayananta W, Puspitasari IM, Levita J. Efficacy and safety of plant-based therapy on recurrent aphthous stomatitis and oral mucositis in the past decade: a systematic review. J Herbmed Pharmacol. 2021;10(2):179-87.

24. Wu CF, Wu HJ, Shih CL, Yeh TP, Ma WF. Efficacy of turmeric in the treatment of oral mucositis in patients with head and neck cancer after radiotherapy or chemoradiotherapy: a systematic review and meta-analysis. Front Pharmacol. 2024; 15:1363202.

25. Zhang L, Tang G, Wei Z. Prophylactic and Therapeutic Effects of Curcumin on Treatment-Induced Oral Mucositis in Patients with Head and Neck Cancer: A Meta-Analysis of Randomized Controlled Trials. Nutr Cancer.2021;73(5):740-9.

26. Freier K, Engel M, Lindel K, Flechtenmacher C, Mühling J, Hassfeld S, et al. Neoadjuvant concurrent radiochemotherapy followed by surgery in advanced oral squamous cell carcinoma (OSCC): A retrospective analysis of 207 patients. Oral Oncol 2008; 44(2): 116–23.

27. Sonis ST. Oral mucositis. Anticancer Drugs. 2011;22(7):607-12.

28. World Health Organization. WHO handbook for reporting results of cancer treatment. 1979;48: https://iris.who.int/handle/10665/37200.

29. Sonis ST. The biologic role for nuclear factor-kappaB in disease and its potential involvement in mucosal injury associated with anti-neoplastic therapy. Crit Rev Oral Biol Med. 2002;13(5):380-9.

30. Lüer S, Troller R, Jetter M, Spaniol V, Aebi C. Topical curcumin can inhibit deleterious effects of upper respiratory tract bacteria on human oropharyngeal cells in vitro: potential role for patients with cancer therapy-induced mucositis? Support Care Cancer. 2011;19(6):799-806.

31. Elad S, Meidan I, Sellam G, Simaan S, Zeevi I, Waldman E, et al. Topical curcumin for the prevention of oral mucositis in pediatric patients: case series. Altern Ther Health Med. 2013;19(3):21-4.

32. Zhang Y, Huang Y, Li Z, Wu H, Zou B, Xu Y. Exploring Natural Products as Radioprotective Agents for Cancer Therapy: Mechanisms, Challenges, and Opportunities. Cancers (Basel). 2023;15(14):3585.

33. Dulbecco P, Savarino V. Therapeutic potential of curcumin in digestive diseases. World J Gastroenterol. 2013;19(48):9256-70.

34. Soni TP, Gupta AK, Sharma LM, Singhal H, Sharma S, Gothwal RS. A Randomized, Placebo-Controlled Study to Evaluate the Effect of Bio-Enhanced Turmeric Formulation on Radiation-Induced Oral Mucositis. ORL J Otorhinolaryngol Relat Spec. 2022;84(2):103-13.


DOI: https://doi.org/10.36489/saudecoletiva.2025v15i93p14888-14894