



# SYSTEMATIC REVIEW ON EFFECTIVENESS OF LYCOPENE IN THE TREATMENT OF PERIODONTITIS

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## ABSTRACT

**Aim:** To assess the effectiveness of Lycopene as one of the interventions for the treatment of periodontitis.

**Methodology:** A systematic review of controlled trials was performed. Electronic and hand searches retrieved 186 records, and 184 were screened. Three studies were included in this systematic review. The intervention and outcomes were assessed in the study included in the systematic review.

**Result:** Three results were included in the systemic review, of which all are clinical trials. Where Lycopene shows efficacy in the treatment of periodontitis. The outcome and results were positive in the studies above, showing that Lycopene significantly reduces probing depth, bleeding on probing, and reduction in plaque.

**Conclusion:** In the present study, the applicable confirmation recommends that Lycopene may be competent in the management of periodontitis. The studies revealed that Lycopene is a promising candidate in the treatment of periodontitis as an anti-oxidative therapy.

**KEYWORDS:** Lycopene, Periodontitis, Intervention, Clinical trials.

## INTRODUCTION

Lycopene is a carotenoid, a natural pigment that gives some vegetables and fruits their red colour. It's held by a class of compounds known as the carotenoids, which are the yellow, orange and red pigments synthesized in plants. The five principle carotenoids found in human plasma as the result of ingesting plants, including alpha and beta-carotene, beta-cryptoxanthin, lutein and Lycopene. The biggest known source of Lycopene are tomatoes. There is a positive key relationship between lycopene consumption and a reduction in the risk of development of degenerative diseases succeeded by free radicals, such as cancer, cardiovascular diseases, asthma, arthritis, stroke, hepatitis and also periodontitis. Studies have been enthusiastically conducted with Lycopene, whereas it could be an alternative to safeguard patients against the harmful effects of free radicals. There is deficient information in the studies regarding the effect of Lycopene on periodontal health.

The name "periodontitis" is defined as inflammation around the tooth. Microorganisms such as bacteria cling to the surface of the tooth and in the pockets surrounding the tooth,

and they multiply, where the immune system reacts, and toxins are released, inflammation begins. Untreated periodontitis will gradually result in tooth loss. Commonly resulting in poor tooth alignment, receding gums, pockets between the teeth, sensitivity, etc.

Carotenoids are dominant AO agents which are important in the maintenance of the overall health of an individual and have a defensive role against cancer, heart diseases, and oral malignancies and diseases, etc. Including the carotenoids, Lycopene is the most potent AO. Thus, also enhancing the effect of other carotenoids. It also possesses antibacterial and anti-fungal properties. It is an adjuvant in the treatment of periodontitis along with oral prophylaxis. Lycopene exerts potent anti-fungal activity against *Candida albicans* by causing significant damage to the cell membrane.

In order to treat this condition, Lycopene is considered a powerful antioxidant, and the main carotenoid in tomato products contains the greatest quenching ability of singlet oxygen among the various carotenoids and is effectual in protecting blood lymphocytes from radical damage. Hence,



the aim of the present study is to investigate the effectiveness of Lycopene in the treatment of periodontitis.

## MATERIALS AND METHODS

### STUDY DESIGN

A systematic review of the effectiveness of Lycopene in the treatment of periodontitis.

### SEARCH STRATEGY

The following electronic databases were used to find published articles on the effectiveness of Lycopene in the treatment of periodontitis PubMed, Cochrane Library, Ovid midline, Elsevier science direct, Wiley online library, Grey literature, Cinahl, Prospero, OSF, Scopus. Each database was searched to obtain the articles using Mesh representation. The mesh term used was “Lycopene in Periodontitis”. After the search, a total of 186 articles were obtained, among which three articles were finalized for further studies.

### ELIGIBILITY CRITERIA

- **Inclusion criteria:**
- Studies published in English
- Articles on the effectiveness of Lycopene in periodontitis
- Clinical trial studies
- Full-text articles
- Publications over the years

### - Exclusion criteria

- Articles published in other languages
- Only abstracts available
- Unrelated articles
- Animal studies
- In-vitro studies

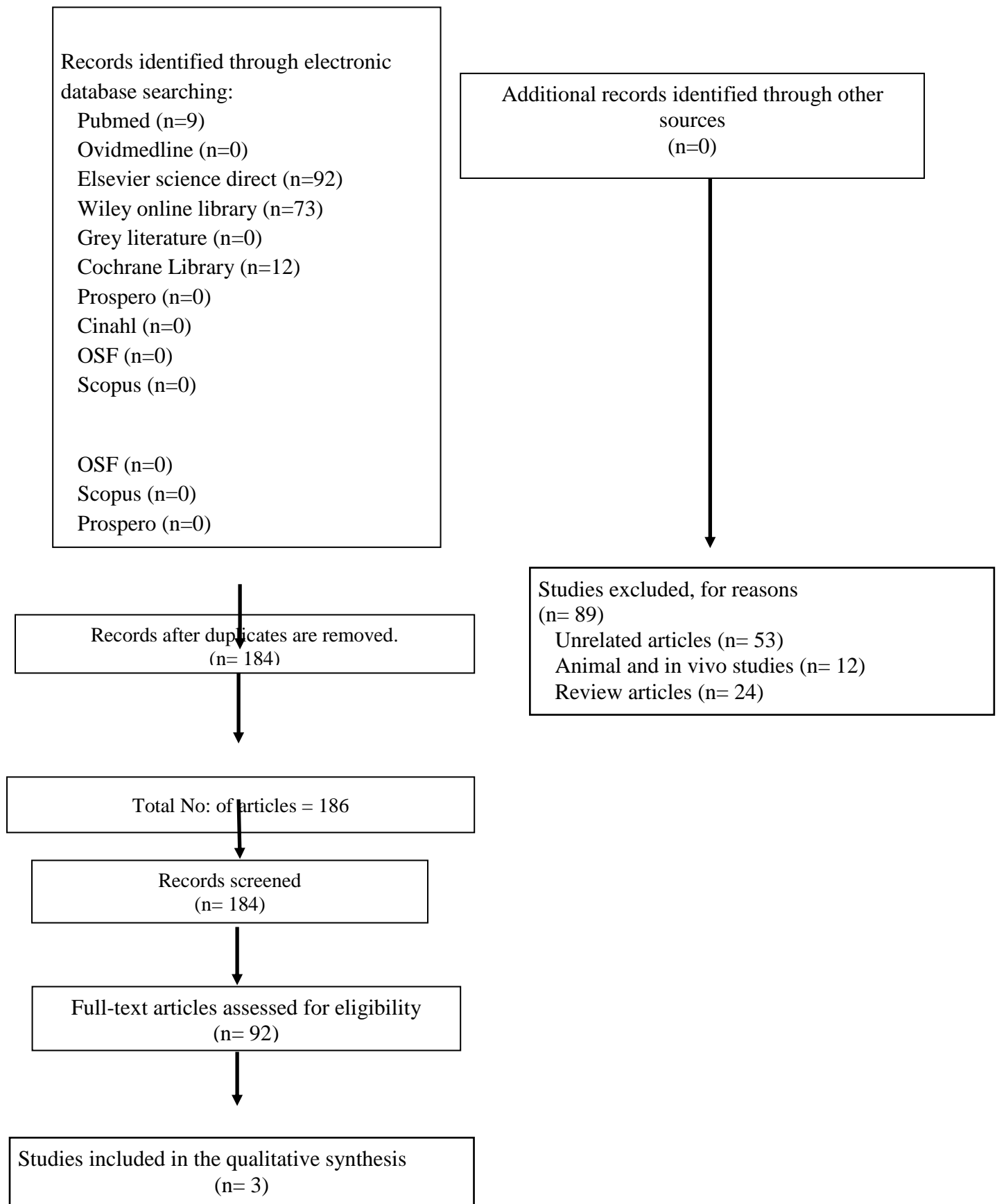
### SEARCH ENGINES

- PubMed
- Ovid medicine
- Elsevier Science Direct
- Wiley online library
- Grey literature
- Cochrane library
- Cinahl
- Prospero
- OSF
- Scopus

After the search using the appropriate mesh terms, a total of 186 articles were found from the online databases. After duplicate removal, 184 articles were screened, and 92 full-text articles were available. Inclusion-exclusion criteria were applied, and the final three articles were selected for further assessment. Figure 1 shows the flow diagram of a number of studies identified, screened, assessed for eligibility, excluded and included in the systemic review.



**Figure 1: Flow diagram showing the number of studies identified, screened, assessed for eligibility, excluded and included in the systematic**





**RESULT**

**Table 1: CHARACTERISTICS OF THE INTERVENTION IN THE INCLUDED STUDIES**

AUTHOR	YEAR	PATIENT SELECTION	DURATION	PREPARATION USED	INTERVENTION
Sphoorthi Anup Belludi, <i>et al.</i>	2013	10 patients of the age group (30 + 41.6 years) with mild to moderate periodontitis	2 weeks	4 mg lycopene/day	Groups A and B were randomly distributed: A- 4 mg lycopene/day for 2 weeks with oral prophylaxis  B- Receiving only oral prophylaxis.
Pragya Tripathi, <i>et al.</i>	2019	30 patients with generalized periodontitis with	45 days	Oral Lycopene and green tea extract	Two groups: A- Received oral lycopene and green tea extract  B- Received full mouth oral prophylaxis
Manasa Ambati, <i>et al.</i>	2017	20 patients with chronic periodontitis were recruited.	2 months	8 mg Lycopene daily	Interventional single-arm study.

Table 1: Shows the characteristics of the intervention in the included studies. In all the above studies, the effectiveness of Lycopene in the treatment of periodontitis was reviewed and

compared. Trials were conducted in patients with mild-moderate periodontitis. Trial duration (1-2 months) and preparations used varied in each study.



**Table 2: OUTCOME DATA AS REPORTED IN INCLUDED STUDIES**

AUTHOR	YEAR	OUTCOME	RESULT
Sphoorthi Anup Belludi, <i>et al.</i>	2013	Bleeding on probing, clinical attachment loss and probing depth scores were found to be statistically non significant in control group A.	The outcome suggests that Lycopene may be of benefit in the treatment of periodontitis.
Pragya Tripathi, <i>et al.</i>	2019	Both treatment groups demonstrated a statistically highly significant reduction in plaque and SBI.	The outcome suggests that Lycopene with green tea extract is a promising adjunctive prophylactic and therapeutic modality in the treatment of periodontitis patients.
Manasa Ambati, <i>et al.</i>	2017	On recording clinical parameters after 2 months, a significant reduction in probing depth and clinical attachment loss.	The outcome suggests that there was a reduction in oxidative stress and improvement in clinical parameters following systemic antioxidant therapy (Lycopene).

Table 2: Shows the outcome and result of the effectiveness of Lycopene in the treatment of periodontitis in the above-mentioned studies. The outcome and results were positive in

the studies above, showing that Lycopene significantly reduces probing depth, bleeding on probing, and reduction in plaque.

**Table 3: BIAS ANALYSIS OF INCLUDED STUDIES**

AUTHOR	RANDOM SEQUENCE GENERATION	ALLOCATION CONCEALMENT	SELECTIVE REPORTING	INCOMPLETE OUTCOME DATA	BLINDING OF OUTCOME ASSESSMENT	BLINDING PARTICIPANTS AND PERSONALS
Sphoorthi Anup Belludi, <i>et al.</i>	++	-	++	++	++	++
Pragya Tripathi, <i>et al.</i>	++	-	++	++	-	-
Manasa Ambati, <i>et al.</i>	++	-	?	-	-	?

Table 3: Shows the biased analysis of all the included studies. It is categorized as the following:

- LOW RISK- (++)
- HIGH RISK- (-)
- UNCLEAR- (?)

Categorization was done according to the Cochrane risk of bias tools for randomized controlled trials.



## DISCUSSION

Periodontitis is an inflammatory condition representing the response of the periodontal tissues to lipopolysaccharide derived from Gram-negative anaerobic bacteria. Inflammation is known to be a protective response that focuses on the removal of the stimuli responsible for damage to the tissues, thereby leading to the restoration of health.

There is an increasing body of evidence available to implicate reactive oxygen species (ROS) in the pathogenesis of a variety of inflammatory disorders, of which periodontal disease is no exception. A variety of ROS (e.g. superoxide and hydroxyl radicals, hydrogen peroxide, and singlet oxygen) can generate substantial tissue damage by initiating a free radical chain reaction. Modulation of the free radical fabrication is indispensable for the suppression of tissue destruction, and treatment with drugs that the production of free ROS or block its effects is therapeutically valuable.

Recent investigations on animal models suggest that antioxidant therapies, which interfere with ROS, may be of benefit in the treatment of periodontitis. Many chemotherapeutic agents used in periodontics, in addition to their antiseptic and antimicrobial effects, are known to have an anti-oxidative activity against spontaneous oxidation. Among the common carotenoids, Lycopene stands as the most potent antioxidant. Lycopene exhibits the highest physical quenching rate with singlet oxygen and is at least three-fold more effective than  $\beta$ -carotene in preventing cell death by quenching NOO-radicals. Lycopene minimizes cell damage by:

1. Limiting free-radical formation
2. Destroying the free radicals or their precursors
3. Stimulating antioxidant enzyme activity
4. Repairing oxidative damage
5. Stimulating repair enzyme activity
6. Reversing DNA damage induced by H<sub>2</sub>O<sub>2</sub>.

A randomized, placebo-controlled, split-mouth study of periodontitis was performed by Chandra *et al.* (2007) on 20 healthy subjects with clinical signs of periodontitis. The treatment group ( $n = 10$ ) was augmented with 8 mg/day of Lycopene, whereas the control group ( $n = 10$ ) received a placebo daily for two weeks. In this study, the patients encountering the lycopene treatment showed statistically significant reductions in periodontitis and bleeding index. This study compared the effectiveness of Lycopene as an effective treatment to mechanical therapy.

## CONCLUSION

In conclusion, the results show that Lycopene is a promising candidate in the treatment of periodontitis as an anti-oxidative therapy; however, further research is needed to clarify its potential function in human oral health according to the following criteria:

- Factors influencing the uptake of Lycopene in the diet, including the way it interacts with other carotenoids.
- Human metabolism is based on the possible function of the metabolites.
- Studies are based on pieces of evidence of treatment in human beings.

- Mechanisms of lycopene deposition in human tissues.
- Lycopene affects the immunological system.

## LIMITATIONS

The limitation of this study is based on fewer clinical trials included in the systematic review. The long-term effectiveness of Lycopene has not been established in the studies. Sometimes, the effect of Lycopene was dependent on oral prophylaxis. Thus, further studies show minimizing the effect of these limitations by evaluating these carotenoids in randomized placebo-controlled clinical trials and reporting on long-term follow up.

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