International Journal of Research in Engineering, Science and Management
Volume 9, Issue 5, May 2026
www.ijresm.com | E-ISSN: 2581-5792 | RESAIM Publishing | www.resaim.com

Tooth Whitening in Clinical Practice: An Evidence-Based Review of Efficacy and Safety

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***Abstract*: Tooth whitening is one of the most commonly requested cosmetic dental procedures. Despite its popularity, misconceptions regarding safety, efficacy, and long-term effects remain prevalent. This review aims to provide an evidence-based overview of tooth whitening methods, mechanisms of action, indications, contraindications, and safety considerations. Both in-office and at-home bleaching techniques are effective when used under professional supervision, with minimal adverse effects. Patient selection, appropriate concentration of bleaching agents, and post-treatment care play critical roles in achieving optimal outcomes.**

***Keywords*: Tooth whitening, dental bleaching, hydrogen peroxide, carbamide peroxide, enamel safety, dentinal hypersensitivity.**

1. Introduction

Dental aesthetics significantly influence self-esteem and social interactions. Tooth discoloration is a common concern, often leading patients to seek whitening treatments. The increasing demand for aesthetic procedures has led to widespread availability of both professional and over-the-counter whitening products [1].

However, misuse of these products and lack of professional guidance can result in undesirable outcomes, including sensitivity and soft tissue irritation [2]. This article reviews current evidence on tooth whitening to support safe and effective clinical practice.

2. Etiology of Tooth Discolouration

Tooth discoloration can be broadly classified into:

Extrinsic Stains: Caused by chromogenic agents such as coffee, tea, tobacco, and poor oral hygiene, these stains affect the enamel surface and respond well to whitening procedures [3].

Intrinsic Stains: These arise from systemic or developmental factors such as fluorosis, trauma, aging, or tetracycline exposure and are often more resistant to treatment [4].

3. Mechanism of Action – Whitening Agents

Tooth whitening involves the use of peroxide-based agents such as hydrogen peroxide and carbamide peroxide. These agents release reactive oxygen species that oxidize chromogenic compounds within enamel and dentin, resulting in a lighter tooth shade [5].

Carbamide peroxide breaks down into hydrogen peroxide and urea, allowing a slower and sustained release suitable for home-based treatments [6].

4. Whitening Techniques

A. In-Office Bleaching

High concentrations of hydrogen peroxide (15–40%) are used under professional supervision, providing rapid and controlled results [7].

B. At-Home Bleaching

Lower concentrations (10–22% carbamide peroxide) are used with trays or strips, offering gradual but effective whitening [8].

5. Efficacy of Tooth Whitening

Both in-office and at-home bleaching techniques have demonstrated significant improvements in tooth shade. The effectiveness depends on the type of discoloration, concentration of bleaching agents, and duration of application [9]. Extrinsic stains respond more favorably compared to intrinsic stains [3].

6. Safety and Adverse Effects

Tooth whitening is considered safe when used appropriately. The most common adverse effects include:

A. Dentinal Hypersensitivity

A transient condition caused by peroxide diffusion through enamel and dentin [10].

B. Gingival Irritation

Occurs due to soft tissue exposure to bleaching agents and is usually reversible [11].

Current evidence suggests no significant long-term damage to enamel when approved concentrations are used under professional supervision [12].

Clinical Considerations:

- Proper patient selection is critical
- Existing restorations do not respond to bleaching
- Sensitivity should be managed prior to treatment

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- Realistic expectations must be communicated

C. Post-Treatment Care and Maintenance

Patients are advised to avoid staining agents for 24–48 hours and maintain good oral hygiene practices. Periodic touch-up treatments may be required to sustain results [9].

7. Conclusion

Tooth whitening is a safe and effective aesthetic procedure when performed using evidence-based protocols. Dental professionals play a key role in ensuring appropriate case selection, minimizing risks, and optimizing outcomes.

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