

Tooth Whitening: A Recipe for Disaster or a Safe and Effective Treatment?

***Harrison A. OMOKHUA**

**Department of Restorative Dentistry
University of Benin
Benin City, Nigeria*

Correspondence

*Dr H. A. Omokhua
Department of Restorative Dentistry
University of Benin
Benin City, Edo State, Nigeria
Email: harrison.omokhua@uniben.edu*

The demand for tooth whitening has increased considerably in recent years as patients place greater value on dental appearance and smile aesthetics. Despite its popularity, concerns remain regarding the biological safety, clinical effectiveness, and potential adverse effects of bleaching agents on dental hard tissues, pulp, and surrounding soft tissues. This narrative review examines the fundamental principles of tooth whitening, including the mode of action of commonly used bleaching agents, available treatment modalities, clinical advantages, associated risks, contraindications, and key measures required to ensure patient safety. Available evidence indicates that tooth whitening is a safe, conservative, and effective aesthetic procedure when performed with appropriate case selection and professional supervision. In contrast, indiscriminate use of high-concentration bleaching agents, prolonged exposure, and unsupervised over-the-counter whitening are strongly associated with increased incidence of tooth sensitivity, gingival irritation, enamel alterations, and pulpal inflammation. Dentist-supervised whitening, therefore, remains the most reliable approach for achieving predictable outcomes while minimising adverse effects.

Keywords: Tooth whitening; dental bleaching; hydrogen peroxide; carbamide peroxide; tooth sensitivity; aesthetic dentistry

INTRODUCTION

In contemporary dental practice, aesthetics has become an essential component of patient care, with tooth colour widely recognised as a major determinant of an attractive smile. Tooth discolouration may occur due to extrinsic factors such as consumption of chromogenic foods and beverages, tobacco use, and inadequate oral hygiene, as well as intrinsic causes including fluorosis, tetracycline exposure, trauma, and age-related structural changes within enamel and dentine (Joiner, 2006). As a result, many patients seek minimally invasive treatment options to enhance dental appearance.

Tooth whitening has gained widespread acceptance because it offers visible aesthetic improvement without the irreversible loss of tooth structure associated with restorative procedures such as crowns or veneers. However, the increasing availability of non-professional whitening services and over-the-counter (OTC) products has generated concern within the dental profession. Clinical reports of sensitivity, gingival injury, enamel surface changes, and pulpal

reactions have contributed to public uncertainty regarding the safety of whitening procedures.

Citation: Omokhua HA (2026). Tooth Whitening: A Recipe for Disaster or a Safe and Effective Treatment? Nig J Dent Sci; 9(2):38-40.

Against this background, tooth whitening is often viewed with ambivalence—praised for its cosmetic benefits yet criticised for its potential risks. This review evaluates whether tooth whitening represents a safe and effective treatment or a possible “recipe for disaster,” with particular emphasis on biological mechanisms, clinical outcomes, complications, and the role of professional supervision.

Mechanism of Action of Tooth Whitening

The whitening of teeth is achieved primarily through the application of peroxide-based bleaching agents, most commonly hydrogen peroxide and carbamide peroxide. Hydrogen peroxide functions as the active component, while carbamide peroxide decomposes

into hydrogen peroxide and urea when exposed to moisture in the oral environment (Kwon & Wertz, 2015). Due to its low molecular weight, hydrogen peroxide is capable of diffusing through enamel interprismatic spaces and dentinal tubules. Within the tooth structure, it releases reactive oxygen species that oxidise organic chromophores responsible for tooth discolouration. This chemical reaction reduces the molecular complexity and pigmentation of these compounds, resulting in a perceptible lightening of tooth colour without mechanical abrasion or removal of enamel (Dahl & Pallesen, 2003).

The extent of whitening achieved depends on several variables, including peroxide concentration, duration and frequency of exposure, and individual tooth characteristics such as enamel thickness and dentinal permeability. Teeth with increased permeability may respond more rapidly but are also more prone to post-operative sensitivity.

Tooth Whitening Methods

Current whitening techniques used in clinical practice can be broadly categorised into three groups.

In-Office Whitening

In-office bleaching is conducted entirely within the dental clinic using high-concentration hydrogen peroxide, typically between 25% and 40%. Protective measures such as rubber dam isolation or light-cured gingival barriers are employed to safeguard soft tissues. This method allows for close clinical monitoring and provides rapid results, making it suitable for patients seeking immediate aesthetic improvement (Carey, 2014).

Dentist-Supervised Home Whitening

This approach involves the fabrication of customised trays and the use of lower concentrations of carbamide peroxide (10–20%) or hydrogen peroxide. Patients apply the bleaching agent at home for prescribed durations, usually over one to two weeks. Owing to controlled dosage, tailored trays, and professional oversight, this technique is regarded as one of the safest and most predictable whitening options (Haywood and Heymann, 1989).

Over-the-Counter Whitening Products

OTC whitening products include toothpastes, strips, gels, and pre-formed trays that are readily available to the public. Although convenient and affordable, these products are frequently used without adequate guidance. Variations in peroxide concentration, poor tray adaptation, and prolonged or inappropriate use increase the likelihood of adverse effects and uneven whitening outcomes (Kwon & Wertz, 2015).

Benefits of Tooth Whitening

When appropriately prescribed and supervised, tooth whitening offers several advantages:

- **Clinical safety:** Research indicates that professionally supervised bleaching does not result in permanent damage to enamel, dentine, or pulp tissues (Dahl & Pallesen, 2003).
- **Preservation of tooth structure:** Whitening improves aesthetics without sacrificing healthy tooth substance.
- **Demonstrated effectiveness:** Most patients experience noticeable shade improvement, particularly in cases of extrinsic and mild intrinsic staining.
- **Psychological benefit:** Enhanced dental appearance often leads to improved self-confidence and patient satisfaction.
- **Transient adverse effects:** Common side effects, such as mild sensitivity, are generally short-lived and reversible (Haywood, 2000).

Potential Problems: When Whitening Becomes a “Recipe for Disaster”

Complications associated with tooth whitening are largely related to inappropriate use or lack of professional oversight.

Tooth Sensitivity

Temporary sensitivity is the most frequently reported adverse effect and is attributed to increased dentinal permeability and pulpal stimulation. The risk increases with higher peroxide concentrations and extended exposure times.

Gingival Irritation

Soft tissue injury may occur if bleaching agents come into prolonged contact with the gingiva, particularly when ill-fitting trays or poorly regulated OTC products are used.

Enamel Changes

Evidence suggests that repeated or improper application of strong bleaching agents can result in surface roughening, mineral loss, and increased enamel susceptibility to staining (Attin et al., 2004).

Uneven Whitening

Restorative materials such as composites, crowns, and veneers do not respond to bleaching, which may lead to colour discrepancies and necessitate restorative replacement.

Pulpal Reactions

Excessive or uncontrolled bleaching may trigger reversible pulpal inflammation, especially in teeth with structural defects or extensive restorations.

Non-Dental Whitening Centres

Whitening services provided by non-dental personnel often lack adequate patient assessment and may employ unsafe protocols, thereby increasing the risk of complications.

Factors That Promote Safe and Effective Whitening

Predictable and safe outcomes are more likely when:

- Whitening is performed by or under the supervision of a dentist
- Appropriate agent concentration and exposure duration are selected
- Custom-made trays are used to minimise soft tissue contact
- A comprehensive clinical examination is undertaken before treatment
- Desensitising and remineralising agents are incorporated when indicated
- Patients receive clear instructions regarding oral hygiene and diet

Contraindications

Tooth whitening should be avoided or deferred in the following situations:

- Pregnancy and lactation
- Presence of untreated caries, enamel cracks, or severe sensitivity
- Teeth with extensive restorations requiring replacement
- Known allergy or hypersensitivity to peroxide-based agents
- Patients younger than 16 years due to increased pulpal vulnerability

CONCLUSION

Tooth whitening should not be regarded as an inherently hazardous procedure. When carried out following appropriate diagnosis, case selection, and professional supervision, it represents a safe, conservative, and effective means of improving dental aesthetics. Most adverse outcomes arise from unsupervised use, excessive application of bleaching agents, and failure to identify contraindications. Dentist-supervised whitening, therefore remains the preferred approach, offering predictable results while minimising biological risks.

REFERENCES

- Attin T, Hannig C, Wiegand A, Attin R (2004) Effect of bleaching on restorative materials and restorations – a systematic review. *Dent Mater*; 20(9):852-861.
- Carey CM (2014). Tooth whitening: what we now know. *J Evidence-Based Dental Pract*; 14:70–76.
- Dahl JE, Pallesen U (2003) Tooth bleaching – a critical review of the biological aspects. *Crit Rev Oral Biol Med*; 14(4):292–304.
- Haywood VB (2000). Nightguard vital bleaching: current concepts and research. *J Am Dent Assoc*; 131(5):653–660.
- Haywood VB, Heymann HO (1989). Nightguard vital bleaching. *Quintessence Int*; 20(3):173–176.
- Joiner A (2006). The bleaching of teeth: a review of the literature. *J Dent*; 34(7):412–419.
- Kwon SR, Wertz PW (2015). Review of the mechanism of tooth whitening. *J Esthetic Res Dent*; 27(5): 240–257.