

THE REAL BENEFITS AND HARMS OF POPULAR AT-HOME TEETH WHITENING METHODS

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Annotation

At-home teeth whitening methods have become increasingly popular in recent years due to their affordability and ease of use. These methods include whitening strips, gels, pens, as well as non-professional remedies such as lemon juice, baking soda, and activated charcoal [1, 2]. While these approaches may provide short-term aesthetic improvement, improper and uncontrolled use can lead to enamel erosion, increased tooth sensitivity, and damage to gingival tissues [3, 4]. This study aims to scientifically evaluate the real benefits and potential risks of commonly used at-home teeth whitening methods.

Keywords

teeth whitening, at-home methods, tooth enamel, dentin sensitivity, dental safety.

Annotatsiya

Uy sharoitida qo'llaniladigan tish oqartirish usullari so'nggi yillarda arzonligi va qulayligi sababli keng ommalashib bormoqda. Ushbu usullar tarkibiga oqartiruvchi tasmalar, gel va qalamlar, shuningdek, limon sharbati, soda va faollashtirilgan ko'mir kabi xalqona vositalar kiradi [1, 2]. Mazkur vositalar qisqa muddatli estetik natija berishi mumkin bo'lsa-da, ularning nazoratsiz va noto'g'ri qo'llanilishi tish emali eroziyasi, dentin sezuvchanligi hamda milk to'qimalarining shikastlanishiga olib kelishi mumkin [3, 4]. Ushbu tadqiqot uy sharoitida ommalashgan tish oqartirish usullarining real foyda va zararlarini ilmiy asosda baholashga qaratilgan.

Kalit so'zlar

tish oqartirish, uy sharoitidagi usullar, tish emali, dentin sezuvchanligi, stomatologik xavfsizlik.

Аннотация

Методы отбеливания зубов в домашних условиях в последние годы приобрели широкую популярность благодаря своей доступности и простоте применения. К таким методам относятся отбеливающие полоски, гели, карандаши, а также народные средства, такие как лимонный сок, пищевая сода и активированный уголь [1, 2]. Несмотря на возможный кратковременный эстетический эффект, неконтролируемое и неправильное использование данных средств может привести к эрозии зубной эмали, повышенной чувствительности дентина и повреждению тканей десны [3, 4]. Данное исследование направлено на научную оценку реальной пользы и возможного вреда популярных домашних методов отбеливания зубов.

Ключевые слова

отбеливание зубов, домашние методы, зубная эмаль, чувствительность дентина, стоматологическая безопасность.

Introduction

Tooth discoloration is a common aesthetic concern that significantly affects individuals' self-confidence and overall quality of life. As public awareness of dental aesthetics has increased, the demand for tooth whitening procedures has grown substantially worldwide [1]. Professional



in-office whitening performed under the supervision of dental specialists is considered the most effective and safest approach; however, high costs, limited accessibility, and fear of dental procedures have encouraged patients to seek alternative solutions at home [2, 3].

In recent years, at-home teeth whitening methods have gained remarkable popularity due to their affordability, convenience, and aggressive marketing through social media and online platforms [4]. Commercially available products such as whitening strips, gels, trays, and pens are widely accessible without professional consultation. In addition to these products, non-professional and traditional remedies, including baking soda, lemon juice, hydrogen peroxide, and activated charcoal, are frequently used despite the lack of scientific guidance regarding their safety and effectiveness [5, 6].

Although many at-home whitening methods claim to deliver rapid and visible results, their mechanisms of action and long-term biological effects on dental tissues remain controversial. Whitening agents primarily act by oxidizing chromogenic compounds within the enamel and dentin; however, excessive or improper use may disrupt enamel integrity and alter the mineral composition of hard dental tissues [7]. Several studies have reported that uncontrolled whitening practices can lead to enamel erosion, increased dentin permeability, hypersensitivity, and irritation of gingival tissues [8, 9].

Moreover, the variability in product composition, concentration of active ingredients, and duration of exposure further complicates the assessment of safety associated with at-home whitening techniques. Unlike professionally supervised treatments, home-use products often lack individualized risk assessment and post-treatment monitoring, increasing the likelihood of adverse effects [10]. This issue is particularly relevant for patients with pre-existing dental conditions such as enamel hypoplasia, caries, gingival recession, or restorations, for whom whitening procedures may pose additional risks [11].

Given the growing prevalence of self-administered whitening practices and the potential consequences of their misuse, there is a clear need for a comprehensive scientific evaluation of these methods. This study aims to analyze the real benefits and potential harms of popular at-home teeth whitening techniques by reviewing current scientific evidence and clinical findings. A deeper understanding of the advantages and limitations of these approaches may contribute to improved patient education, safer clinical recommendations, and the prevention of avoidable dental complications [12, 13].

In addition to structural damage to hard dental tissues, at-home whitening methods may also influence the oral microenvironment. Changes in enamel surface roughness and mineral content can promote bacterial adhesion and biofilm formation, potentially increasing the risk of caries and periodontal inflammation [14, 15]. Furthermore, frequent exposure to acidic or abrasive whitening agents has been shown to disrupt the natural remineralization process of enamel, thereby weakening its protective function over time [16].

Another important concern is the lack of standardized usage instructions and regulatory control for many over-the-counter and non-professional whitening products. The concentration of active bleaching agents, such as hydrogen peroxide or carbamide peroxide, often varies significantly between products, leading to unpredictable clinical outcomes [17]. In some cases, patients exceed recommended application times or combine multiple whitening methods in an attempt to achieve faster results, which further elevates the risk of adverse effects [18].

Patient perception and awareness also play a crucial role in the widespread use of at-home whitening techniques. Many individuals associate “natural” or “homemade” remedies with safety, despite limited scientific evidence supporting such assumptions [19]. This misconception contributes to the uncontrolled use of potentially harmful substances and highlights the necessity of evidence-based patient education provided by dental professionals [20].

Therefore, addressing the benefits and risks of popular at-home teeth whitening methods is not only a matter of aesthetic dentistry but also an important public health issue. Establishing



scientifically grounded guidelines and improving patient knowledge may help reduce preventable complications and encourage safer approaches to tooth whitening [21, 22]. By integrating current research findings with clinical perspectives, this study seeks to contribute to the development of responsible and informed whitening practices.

Research Methodology

This study was conducted using a comprehensive analytical and comparative research design aimed at evaluating the real benefits and potential risks of popular at-home teeth whitening methods. A systematic review of relevant scientific literature was performed to collect data regarding the composition, mechanism of action, effectiveness, and adverse effects of commonly used home whitening techniques [1, 2].

Scientific articles were identified through electronic databases including PubMed, Scopus, and Google Scholar. The search strategy employed keywords such as “at-home teeth whitening,” “over-the-counter whitening products,” “enamel erosion,” and “tooth sensitivity.” Studies published in English between 2010 and 2024 were considered eligible for inclusion to ensure the relevance and timeliness of the analyzed data [3]. Both in vitro and clinical studies were included in order to obtain a comprehensive understanding of the biological effects of whitening agents on dental tissues [4].

In addition to literature analysis, a comparative evaluation of commonly used at-home whitening products was conducted. These products were categorized into commercial whitening agents (whitening strips, gels, trays, and pens) and non-professional or homemade remedies (baking soda, lemon juice, hydrogen peroxide, and activated charcoal) [5]. The active ingredients, concentration levels, application frequency, and manufacturer instructions were analyzed and compared across different product types [6].

To assess the potential impact of these methods on dental hard tissues, findings related to enamel surface morphology, microhardness, mineral content, and dentin permeability were extracted from selected studies [7, 8]. Reported adverse effects, including tooth hypersensitivity, gingival irritation, and enamel demineralization, were systematically reviewed and qualitatively analyzed [9]. Special attention was given to studies evaluating long-term outcomes and cumulative effects associated with repeated or improper use of whitening agents [10].

Furthermore, patient-related factors such as age, oral hygiene status, pre-existing dental conditions, and frequency of whitening procedures were considered as modifying variables influencing treatment outcomes [11]. The methodological quality of the included studies was critically assessed based on sample size, study design, duration of follow-up, and measurement techniques [12].

The collected data were synthesized using a narrative analysis approach to identify common trends, benefits, and risks associated with at-home teeth whitening methods. Ethical approval was not required for this study, as it was based solely on the analysis of previously published data and did not involve direct experimentation on human subjects [13].

Results

The analysis of selected scientific studies demonstrated that at-home teeth whitening methods are capable of producing noticeable short-term improvements in tooth color, particularly when peroxide-based commercial products are used according to manufacturer instructions [1, 2]. Whitening strips and gels containing low concentrations of hydrogen peroxide or carbamide peroxide were found to be moderately effective in reducing extrinsic discoloration and mild intrinsic stains [3].

However, the reviewed literature consistently reported various adverse effects associated with the use of at-home whitening techniques. One of the most frequently observed outcomes was increased tooth sensitivity, which was attributed to enhanced dentin permeability and temporary pulp irritation following repeated exposure to bleaching agents [4, 5]. Sensitivity was



reported to be more pronounced in individuals who exceeded recommended application times or combined multiple whitening methods simultaneously [6].

In vitro studies revealed significant alterations in enamel surface morphology after exposure to acidic and abrasive homemade whitening agents, such as lemon juice and baking soda [7]. These changes included increased surface roughness, decreased microhardness, and partial loss of the enamel's mineral content, all of which may predispose teeth to erosion and caries development [8, 9]. Activated charcoal, despite its growing popularity, showed limited whitening efficacy while demonstrating a high abrasive potential that may contribute to long-term enamel wear [10].

Clinical studies also indicated that improper use of at-home whitening products may negatively affect gingival tissues. Gingival irritation, inflammation, and transient chemical burns were reported, particularly in cases involving poorly fitted whitening trays or excessive gel application [11]. Additionally, individuals with pre-existing dental restorations experienced uneven whitening results, as bleaching agents did not alter the color of composite fillings or crowns, leading to aesthetic discrepancies [12].

Overall, the findings suggest that while at-home teeth whitening methods may offer temporary aesthetic benefits, their uncontrolled or prolonged use is associated with measurable risks to both hard and soft oral tissues. The severity of adverse effects was influenced by factors such as product composition, concentration of active agents, duration of use, and individual oral health status [13, 14].

Literature Review

The growing demand for aesthetic dental procedures has led to increased scientific interest in tooth whitening techniques, particularly those intended for at-home use. Numerous studies have investigated the effectiveness and safety of whitening agents, with a primary focus on peroxide-based products commonly found in over-the-counter formulations [1, 2]. Hydrogen peroxide and carbamide peroxide are widely recognized as the main active ingredients responsible for the bleaching effect through the oxidation of chromogenic molecules within enamel and dentin structures [3].

Several clinical trials have demonstrated that low-concentration peroxide-based at-home whitening products can achieve satisfactory color improvement when used according to professional guidelines [4]. However, comparative studies indicate that their whitening efficacy is generally lower than that of in-office professional treatments, especially in cases of intrinsic discoloration [5]. Despite this limitation, patient preference for home-based methods remains high due to convenience and cost-effectiveness [6].

A significant portion of the literature has focused on the adverse effects associated with at-home whitening methods. Tooth hypersensitivity has been consistently reported as the most common side effect, resulting from increased dentin permeability and transient pulpal inflammation [7, 8]. Studies suggest that the frequency and duration of whitening procedures play a critical role in the severity of sensitivity experienced by patients [9].

In vitro investigations have provided valuable insights into the impact of whitening agents on enamel integrity. Research has shown that prolonged exposure to acidic or abrasive substances, including baking soda and lemon juice, may lead to enamel demineralization, reduced microhardness, and increased surface roughness [10, 11]. These structural changes not only compromise enamel resistance but also facilitate bacterial adhesion, potentially increasing the risk of caries and periodontal disease [12].

Conclusion

The results of the present study demonstrate that popular at-home teeth whitening methods are capable of producing temporary aesthetic improvements, particularly in cases of mild extrinsic tooth discoloration. Peroxide-based over-the-counter products show moderate effectiveness when used in accordance with recommended guidelines [1, 2].



Despite their cosmetic benefits, the uncontrolled or excessive use of at-home whitening methods poses significant risks to oral health. Scientific evidence indicates that improper application may lead to enamel erosion, increased dentin permeability, and heightened tooth sensitivity [3, 4].

Homemade and non-professional whitening remedies, including baking soda, lemon juice, and activated charcoal, were found to offer limited whitening efficacy while exhibiting a higher potential for enamel abrasion and demineralization [5, 6].

The reviewed studies highlight that gingival irritation and soft tissue damage are common adverse effects, particularly in cases involving inappropriate product application or prolonged exposure to whitening agents [7].

Individual factors such as existing dental conditions, frequency of whitening procedures, and duration of exposure significantly influence treatment outcomes and the severity of side effects associated with at-home whitening techniques [8, 9].

The lack of standardized regulations and professional supervision for many at-home whitening products increases the risk of misuse and unpredictable clinical results, emphasizing the need for improved patient education and evidence-based clinical guidance [10].

In conclusion, while at-home teeth whitening methods may be attractive due to their affordability and accessibility, their use should be carefully controlled and preferably guided by dental professionals. Further long-term clinical research is required to establish standardized safety protocols and optimize whitening outcomes without compromising oral health [11, 12].

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