Oral Care Journal of Clinical Oral Medicine and Maxillofacial Surgery

PRIME OPEN ACCESS

Volume 2, Issue 1

Research Article

Date of Submission: 25 Mar, 2026
Date of Acceptance: 25 Apr, 2026
Date of Publication: 04 Apr, 2026

Comparative Study of Tooth Sensitivity, Aesthetic Outcome, and Longevity between In-Office and At-Home Bleaching Methods: A Literature Review

Isopescu Alexandra, Tapalagă Ioana, Hăpăianu Dragoș, Belu Victor, Layla Hammod and Naeem Hamza

'Iuliu Haiteganu' University of Medicine and Pharmacy Cluj Napoca, Romania, Faculty of general medicine, Romania

***Corresponding Author:** Naeem Hamza, 'Iuliu Haiteganu' University of Medicine and Pharmacy Cluj Napoca, Romania, Faculty of general medicine, Romania.

Citation: Isopescu, A., Tapalagă, I., Hăpăianu, D., Belu, V., Hammod, L., et al. (2026). Comparative Study of Tooth Sen- sitivity, Aesthetic Outcome, and Longevity between In-Office and At-Home Bleaching Methods: A Literature Review. *OralCare J Clin Oral Med Maxillofac Surg, 2*(1), 01-06.

Abstract
The following literature review aims to compare the differences in tooth sensitivity, aesthetic outcome, and longevity of in-office, at-home, LED-photoactivated, and combined bleaching methods. After conducting narrative reviews of PubMed-indexed articles, meta-analyses, randomized trials, and systematic reviews from the past 5 years, it was concluded that at-home bleaching achieved efficient whitening and good color stability comparable with in-office bleaching but without the rather notable tooth sensitivity that comes with the high concentrations of hydrogen peroxide used in dental clinics.

Keywords: Tooth Bleaching, In-Office Bleaching, At-Home Bleaching, Hydrogen Peroxide, Tooth Sensitivity, Aesthetic Outcome, Whitening Longevity

Introduction
The demand for improved dental aesthetics has made tooth whitening one of the most requested clinical procedures in modern dentistry. As noted in recent literature, "a beautiful, healthy smile is undoubtedly an expression of psychosomatic well-being" and plays a crucial role in social interactions and self-esteem. The fundamental mechanism of bleaching relies on the application of peroxide-based agents-hydrogen peroxide (HP) or carbamide peroxide (CP). These agents work because "oxygen radicals released by HP effectively react with the organic chromogens through an oxidizing process," which breaks down the pigment molecules responsible for discoloration.

Currently, patients and clinicians must choose between two primary treatment modalities: in-office bleaching and at-home protocols. In-office systems typically utilize high concentrations of hydrogen peroxide (35–40%) for short periods, while at-home systems employ lower concentrations (6–10%) over extended durations. While in-office treatments offer immediate results, they are frequently associated with a greater risk of tooth sensitivity. Conversely, at-home systems are generally safer but require strict patient compliance.

Recent advancements have introduced light activation (LED or laser) and "combined" protocols to potentially enhance efficacy. However, the literature regarding these methods contains conflicting data. While some manufacturers claim light sources speed up the process, systematic reviews warn that "although it is commercially claimed that in-office bleaching associated with light improves and accelerates color change, this study did not confirm this belief". This literature review aims to analyze current evidence regarding the risk profile, aesthetic outcomes, and longevity of these varying whitening protocols to determine the most effective and safe approach.

Methods
To conduct this review, a search was performed using PubMed, among other databases, focusing on literature published within the last five years. The search strategy utilized keywords related to "tooth bleaching," "hydrogen peroxide," "in-office whitening," "at-home whitening," and "light activation."

The inclusion criteria prioritized systematic reviews, meta-analyses, and randomized clinical trials (RCTs) that directly compared different bleaching concentrations and application protocols. The review focused on three primary outcome measures:

- Tooth Sensitivity: Assessed by risk and intensity during and after treatment.
- Aesthetic Outcome: Measured by color change (ΔE) and whiteness indices.
- Longevity: Evaluated by color stability and relapse rates over follow-up periods ranging from one month to two years.

High-Concentration Hydrogen Peroxide 35%-40% (in office) vs Low-Concentration Hydrogen Peroxide 6%-10% (at home)

Tooth Sensitivity

Comparative studies between high-concentration HP used for in-office bleaching and low-concentration HP used for at-home bleaching consistently reveal that in-office bleaching presents a greater risk and severity of tooth sensitivity. But in both methods, the sensitivity is temporary [1-4]. Multiple randomized controlled studies have directly compared in-office bleaching (35%-40% hydrogen peroxide) with at-home bleaching protocols involving lower concentrations (6%-10% hydrogen peroxide). Research indicated that sensitivity levels were notably higher and more pronounced among the in-office groups [2-4].

A randomized controlled trial comparing at-home bleaching with 10% carbamide peroxide to in-office bleaching with 40% hydrogen peroxide reported increased sensitivity in the in-office group, while the at-home group experienced lower sensitivity values during the procedure [2]. A clinical trial comparing various at-home bleaching gel application protocols, all containing 10% hydrogen peroxide, demonstrated that low-concentration at-home bleaching resulted in reduced sensitivity severity. This aligns with the hypothesis that elevated peroxide levels influence pulpal reaction [1]. Another randomized clinical trial that examined at-home, in-office, and combined bleaching protocols observed that the in-office groups experienced significantly higher tooth sensitivity compared to those who solely utilized at-home procedures [5].

Meta-analyses and umbrella reviews support these conclusions, indicating that sensitivity is primarily linked to peroxide concentration rather than application method [6,7]. High-concentration hydrogen peroxide can diffuse through both enamel and dentin at a rapid rate, leading to the amplification of pulpal inflammatory response. Conversely, at-home bleaching with low peroxide concentrations results in a slower diffusion process, which is associated with a more favorable sensitivity profile [6,8]. As noted in one systematic review, "higher concentrations of hydrogen peroxide are associated with increased intensity and risk of tooth sensitivity [7].

Aesthetic Outcome

From an aesthetic perspective, the majority of research indicates that high-concentration in-office bleaching yields quicker initial whitening, whereas low-concentration at-home bleaching produces comparable final color change when users adhere to prescribed treatment protocols [3,5,6,9].

Multiple studies, including randomized controlled trials, have quantitatively evaluated tooth color alteration utilizing spectrophotometric measurements such as CIE L*a*b*, ΔE*ab, ΔE00, and the Whiteness Index for Dentistry (WID). Consistent findings across these studies indicated that in-office bleaching using high-concentration hydrogen peroxide resulted in a more immediate perceptible color change following a single session, whereas at-home bleaching required a prolonged period to achieve comparable whitening effects [3,9,10].

A randomized clinical trial with a nine-month follow-up compared at-home and in-office tooth whitening procedures. It was documented that in-office bleaching produced more effective immediate whitening; however, there was no statistically significant difference in the final coloration between the two methods in subsequent assessments [9]. Analogously, a study comparing at-home, in-office, and hybrid bleaching procedures assessed the degree of whitening achieved, revealing that all three methods yielded observable whitening effects, with no statistically significant disparity in final aesthetic outcomes between the at-home and in-office protocols [5].

Additional systematic reviews and meta-analyses have demonstrated that low-concentration bleaching performed at home can achieve results of equivalent aesthetic quality to high-concentration in-office bleaching, provided that patients adhere to the prescribed treatment protocols and duration [6,7]. As summarized in one review, "both at-home and in-office bleaching techniques are effective in improving tooth color, with no clear superiority in final whitening outcomes" [6].

Longevity of Whitening

As for whitening duration, evidence indicates that high-concentration in-office bleaching and low-concentration home bleaching exhibit comparable long-term color stability, though individual outcomes may vary based on follow-up period and bleaching method [5,6,8,9]. Multiple clinical trials and systematic reviews evaluating color relapse at follow-up intervals of 3-9 months have demonstrated no significant differences in color stability between in-office and at-home bleaching methods [5,9].

A randomized clinical trial reported that while in-office bleaching resulted in a more rapid initial whitening process, the

degree of color change over an extended period was comparable between the two methods, ultimately yielding similar shade values upon long-term follow-up [9]. However, other reports indicated that at-home bleaching showed marginally superior color stability. This may be attributed to extended incubation periods at low peroxide concentrations, facilitating more complete oxidation of chromogens [6,8]. But this was not the case with all studies. Systematic analysis determined that the duration of whitening is not exclusively dependent on peroxide concentration [6,7].

High-Concentration Hydrogen Peroxide 35-40% (in office) vs Low-Concentration Hydrogen Peroxide 6-10% with LED Photoactivation (in office)

Tooth Sensitivity

High concentrations of HP (35%–40%) create a steep diffusion gradient, leading to higher levels of peroxide in the pulp and, consequently, increased TS [11]. The use of violet LED (405 nm) allows for a reduction in HP concentration (to approximately 6%–17%) or even the elimination of HP in some experimental models [12]. Clinical trials show that patients treated with low-concentration HP and Violet LED report significantly lower intensity and duration of TS compared to those treated with 35% HP [13].

Enamel hardness is also a matter researched by most recent studies that regard the differences between these two methods, most of them showing no effects or slight effects in comparison with the procedure that only uses LED for low concentration HP, while showing significant differences in comparison with the high concentration HP, that affects the enamel [14]. Clinically, "it is recommended to choose less concentrated hydrogen peroxide gels, as there is a possibility of increased change in enamel microhardness, surface morphology, and acidity of the medium if higher concentrations are used" [12].

Aesthetic Outcome

The comparison varies based on the specific differences between the existing studies. However, in most in vitro studies developed on bovine teeth, assuming all other parameters (time of exposure, compatibility between LED and gel ect) are evenly distributed, evidence indicates that low-concentration HP, when photoactivated by a LED system, produces a color change equivalent (or at least comparable (12)) to 35% HP [14,15].

In a study from 2022 "the 6% HP + violet LED groups showed similar bleaching efficacy compared to 35% HP, while the 6% HP had less expressive results" [11]. This implies that the usage of LED enhances the whitening capacities of low concentration (LC) HP, while other studies even suggest that violet LED might have whitening properties on its own, without a gel [12]. In this case, the color change occurs through a physical process. However, other studies did not find a statistically relevant difference in color after a treatment that only used LED so further research is needed to fully support this claim [11,13].

Results also appear when LC HP is combined with blue LED but unlike the violet LED, there are no arguments towards a stand-alone effect, without the gel [12,15].

Longevity of Whitening

Most of the existing studies focus on the duration of the effects for a period between 6 months and 1 year. At the 6-month mark, there is no statistically significant difference in colour rebound between high-concentration and low-concentration LED-assisted protocols [12,13,15]. The violet LED enhances the action of the whitening agent deeper within the enamel/dentin complex, the results are not merely superficial. This depth of action ensures that the aesthetic outcome is as durable as traditional methods [14].

High-Concentration Hydrogen Peroxide 40% with LED photoactivation (in-office) vs Low-Concentration Hydrogen Peroxide 6-10% (at home)

Tooth Sensitivity

Tooth sensitivity is a reported side effect in both modalities, caused when peroxide penetrates the dental pulp. However, the risk profile differs by technique and activation method. Systematic reviews indicate that while sensitivity is present in both approaches, the use of light activation in high-concentration office treatments is a significant factor.
While earlier studies suggested ambiguity regarding light sources, corrected data from recent umbrella reviews have clarified the risk. Specifically, Aidos et al. note that while light activation systems did not necessarily increase the intensity of pain, they "increased the risk of teeth sensibility" [17]. This supports other findings which state that while "laser activation of the bleaching agent promotes the efficiency of the treatment," it "does not reduce postoperative sensitivity" [18]. Therefore, students and clinicians must recognize that adding LED or laser activation to high-concentration protocols to speed up the process may inadvertently heighten the probability of a patient experiencing sensitivity.

Aesthetic Outcome

Regarding the immediate color change, evidence challenges the assumption that the highest concentrations always yield the superior immediate result. A randomized study comparing in-office 40% hydrogen peroxide against a take-home 6% hydrogen peroxide system found that "the two at-home whitening systems achieved significantly better whitening outcomes than the two in-office products immediately after whitening" [16].

Broader reviews generally suggest that when the total active treatment potential is balanced, "there is no difference between in-office and at-home techniques in terms of color change" [17]. Furthermore, the necessity of LED lights for aesthetics is debated. Meta-analyses have found that "activation of in-office bleaching gel with light does not seem to improve color change," regardless of whether high or low hydrogen peroxide concentrations are used [19]. Thus, the "belief" that light accelerates color change is not consistently confirmed by rigorous clinical data [19].

Longevity of Whitening

The stability of the whitening effect is a critical factor in treatment selection. Research comparing 40% in-office hydrogen peroxide against 6% at-home regimens shows that the efficacy gap narrows over time. One study observed that "at six months after treatments, the differences between at-home and in-office treatments had narrowed significantly," resulting in statistically similar aesthetic outcomes [16].

However, other systematic reviews suggest that at-home protocols may offer better resistance to relapse. In-office dental bleaching has been associated with a "higher recurrence rate" of discoloration compared to at-home treatments [20]. Studies utilizing split-mouth designs have observed that color regression is often faster and more pronounced following high-concentration power bleaching than with tray-based home systems [20]. Therefore, while in-office systems provide rapid results, low-concentration at-home regimens may offer more durable stability with less "rebound" effect over the long term. Research indicates that to achieve comparable whitening outcomes, at-home products may require "14 to 280 times longer treatment durations" than professional in-office procedures [16].

Combined Method: High-Concentration Hydrogen Peroxide 35-40% (in office) & Low-Concentration Hydrogen Peroxide 6-10% (at home)

Tooth Sensitivity

The literature regarding tooth sensitivity (TS) shows no significant change in tooth sensitivity, inconsistent results, or higher TS after the use of combined whitening methods.

One of the studies evaluated a dual whitening technique, combining in-office bleaching with 35% hydrogen peroxide and at-home whitening using pre-filled trays using 6% hydrogen peroxide, applied between the in-office sessions. "[...] the intensity and absolute risk of tooth sensitivity were similar [5].

However, another study that combined protocols of one in-office session (35-40% Hydrogen peroxide) followed by at-home bleaching (6-10% Hydrogen Peroxide or Carbamide peroxide) in trays, reports inconsistent results regarding tooth sensitivity. "One study found increased tooth sensitivity with the use of combined or in-office bleaching .", while "Another reported greater sensitivity with combined and at-home bleaching treatments [18].

Another randomized trial compared at-home bleaching (10% carbamide peroxide) (HB), In-office bleaching (40% Hydrogen peroxide) (OB) and a combined regimen (OHB / HOB) with a different sequence, showing that tooth sensitivity was significantly higher in the groups with in-office treatment ($p=0.006$) than in the group using the at-home bleaching alone ($p= 0.001$) [15].

Aesthetic Outcome

Regarding the esthetic outcome, studies show either an increase in whiteness using a combined method or little to no statistical difference in whiteness using either only at-home or only in-office methods.

The first study used in-office (35% Hydrogen peroxide) bleaching combined with at-home (6% hydrogen peroxide) pre-filled trays, with participants performing 5–10 at-home applications between in-office sessions. Tooth color was measured with a spectrophotometer using ΔE*ab, ΔE00, and ΔWID indices. The results show that more frequent at-home applications enhanced whitening efficiency, which demonstrates that the combination of methods accelerates and strengthens the aesthetic outcomes compared with in-office treatment alone [21].

Another study demonstrates the benefit of the combined method by evaluating the objective tooth colored changes measured at multiple time points, using CIE L*a*b* and CIEDE2000 color analysis and consisting of in-office bleaching with 6% hydrogen peroxide, followed by two weeks of at-home bleaching with 16% carbamide peroxide. The results of this study show that additional at-home whitening with 16% carbamide peroxide enhanced whitening efficiency. "The color change at tin-office was $\Delta Eab = 4.7$ and $\Delta E00 = 3.2$, and overall color change of combined method at t2 was $\Delta Eab = 8.2$ and $\Delta E00 = 5.3$ ($P < 0.05$)" [22].

On the contrary, the next study compared at-home bleaching (10% carbamide peroxide) (HB), In-office bleaching (40% Hydrogen peroxide) (OB), and a combined regimen (OHB / HOB) with a different sequence. Tooth color changes were objectively measured with a spectrophotometer at multiple time points (T0 - baseline and T3 - Day 43) and analyzed using CIEDE2000 (ΔE00) and the whiteness index for dentistry (WID). All bleaching regimes produced significant whitening with no significant difference in outcome between the groups at any point in time. So the combined method was effective but not superior. "No significant differences in WID and ΔWID values were found among the different groups at each time point (all $p>0.05$)" [23].

In addition, another study where in-office bleaching (35–40% hydrogen peroxide), at-home bleaching (6–16% carbamide or hydrogen peroxide), and combined protocols (which typically involved one in-office session followed by at-home bleaching for several days or weeks) evaluated the whitening efficiency using objective color measurement. It showed that all methods produced effective and clinically noticeable color change, but combined protocols did not always prove to be superior [24].

Longevity of Whitening

Regarding the aspect of longevity of the whitening treatment, studies show that the combined protocol is long-term effective or equal to the single procedure.

The first study highlighted that combined whitening methods using three in-office sessions (with application of 35% Hydrogen Peroxide) and prefilled at-home trays (6% Hydrogen Peroxide) had a better color stability compared with only in-office treatment. Color was measured at 1-day, 3-month, 6-month, 1-year, and 2-year follow-ups, demonstrating the long-term efficacy of the combined protocol. The use of the dual-method (at-home and in-office) produced a longer-lasting whitening efficacy [25].

On the other hand, another study applied a combined dental bleaching with one in-office session (35-40% Hydrogen Peroxide) and at-home bleaching with a lower concentration (6-10% either Hydrogen Peroxide or Carbamide Peroxide) in custom trays. Follow-ups of up to 6 months identified that the combined protocol may marginally improve color stability, but overall longevity is similar to single-method bleaching. "A total of 223 patients were analyzed with a follow-up of 14 days (25%), 43 days (25%), 4 weeks (25%), and 6 months (25%)." "The studies analyzed show mixed results" [24].

Results

Even though in-office high-concentration bleaching (35-40% HP) has shown evidence of consistently producing faster initial whitening, it was also associated with a higher incidence and intensity of transient tooth sensitivity. Comparable aesthetic outcomes were proven in low-concentration at-home bleaching (6-10% HP or CP) while also achieving a more favorable sensitivity profile when treatment protocols were properly followed. LED photoactivation, in particular with violet LED, allows the usage of lower peroxide concentration while maintaining similar whitening outcomes and additionally reducing tooth sensitivity. Nevertheless evidence regarding its independent whitening effects remain inconclusive. While some studies contradict each other about the advantages of combined bleaching protocols over single-modality treatments, some studies reported enhanced whitening efficiency and improved long-term stability.

Conclusion

Based on the available research, the final outcomes and longevity of whitening treatments are comparable between in-office and at-home bleaching protocols. When it comes to in-office procedures, the immediate aesthetic improvement comes with a higher sensitivity, while the aLED-enhanced treatment (with a low concentration of HP) shows reduced side effects. The combined method shows promising aesthetic results, but further research is needed in order to confirm its superiority over standalone whitening protocols.
From a clinical standpoint, the technique the doctor chooses should always be correlated with each individual patient's needs, expectations, and compliance to treatment.

References

1. Aragão, W. A. B., Chemelo, V. S., Alencar, C. D. M., Silva, C. M., Pessanha, S., Reis, A., ... & Lima, R. R. (2024). Biological action of bleaching agents on tooth structure: A review. Histol Histopathol, 39(10), 1229-1243.
2. Martins, L. M., e Souza, L. L., Sutil, E., da Silva, L. M., Silva, J. O. S., Reis, A., & Loguercio, A. D. (2020). Clinical effects of desensitizing prefilled disposable trays in in-office bleaching: a randomized single-blind clinical trial. Operative dentistry, 45(1), E1-E10.
3. Altınışık, H., & Nezir, M. (2025). Clinical evaluation of in-office bleaching with low, medium, and high concentrate hydrogen peroxide: a 6-month a double-blinded randomized controlled trial. Clinical Oral Investigations, 29(5), 260.
4. Rezende M, Loguercio AD, Reis A, Kossatz S, Tay LY. Tooth sensitivity in different arches after in-office dental bleaching: a multicenter randomized clinical trial. Clin Oral Investig. 2024;28:146.
5. Hortkoff, D., Farago, P. V., Gomes, J. C., Reis, A., & Gomes, G. M. (2025). In-office Bleaching After a Desensitizing Protocol: a 4.5-Year Follow-up of a Randomized Controlled Trial. Journal of Dentistry, 105932.
6. Rezende M, Coppla FM, Chemin K, Loguercio AD, Reis A (2024). Dental bleaching: concentration of hydrogen peroxide and light activation. Bioengineering (Basel).11:1178.
7. Buzatu, B. L. R., Luca, M. M., Galuscan, A., Vaduva, A. O., Fratila, A. D., Dumitrescu, R., ... & Jumanca, D. (2025). From Microstructure to Shade Shift: Confocal and Spectrophotometric Evaluation of Peroxide-Induced Dental Bleaching. Journal of Clinical Medicine, 14(13), 4642.
8. Hortkoff, D., Farago, P. V., Gomes, J. C., Reis, A., & Gomes, G. M. (2025). In-office Bleaching After a Desensitizing Protocol: a 4.5-Year Follow-up of a Randomized Controlled Trial. Journal of Dentistry, 105932.
9. Chu, S., Wang, Y., Duan, Z., Wu, P., & Wang, Y. (2025). Effect of low-concentration at-home bleaching gels on whitening and tooth sensitivity: a split mouth randomized clinical trial. BMC Oral Health, 25(1), 1-14.
10. Rezende M, De Geus JL, Kossatz S, Loguercio AD, Reis A. Bleaching efficacy of in-office dental bleaching with

different application protocols: a single-blind randomized controlled trial. Clin Oral Investig. 2024;28:335.
11. Costa, J. L. D. S. G., Besegato, J. F., Zaniboni, J. F., Galvani, L. D., & Kuga, M. C. (2022). Effects of tooth bleaching protocols with violet LED and hydrogen peroxide on enamel properties. Photodiagnosis and Photodynamic Therapy, 38, 102733.
12. Menezes, C. F. S., Furtado, G. S., Sarra, G., Marques, M. M., Rodrigues, V. P., & Lago, A. D. N. (2022). Violet led dental whitening: Effectiveness and biological safety: An in vitro study. Photodiagnosis and Photodynamic Therapy, 39, 102965.
13. Santos, A. E. C. G., Bussadori, S. K., Pinto, M. M., Brugnera, A. J., Zanin, F. A. A., Silva, T., ... & Horliana, A. C. R. T. (2021). Clinical evaluation of in-office tooth whitening with violet LED (405 nm): A double-blind randomized controlled clinical trial. Photodiagnosis and photodynamic therapy, 35, 102385.
14. Costa, J. L. D. S. G., Besegato, J. F., & Kuga, M. C. (2021). Bleaching and microstructural effects of low concentration hydrogen peroxide photoactivated with LED/laser system on bovine enamel. Photodiagnosis and Photodynamic Therapy, 35, 102352.
15. Costa, J. L. D. S. G., Besegato, J. F., Zaniboni, J. F., Vitória, M. S., Gelio, M. B., & Kuga, M. C. (2022). Whitening efficacy of low concentration hydrogen peroxide photoactivated with blue or violet LED. Photodiagnosis and Photodynamic Therapy, 39, 103028.
16. Zhao, X., Pan, J., Malmstrom, H., & Ren, Y. (2023). Treatment durations and whitening outcomes of different tooth whitening systems. Medicina, 59(6), 1130.
17. Aidos, M., Marto, C. M., Amaro, I., Cernera, M., Francisco, I., Vale, F., ... & Paula, A. B. (2024). Comparison of in-office and at-home bleaching techniques: An umbrella review of efficacy and post-operative sensitivity. Heliyon, 10(3).
18. Kikly, A., Jaâfoura, S., & Sahtout, S. (2019). Vital laser-activated teeth bleaching and postoperative sensitivity: A systematic review. Journal of Esthetic and Restorative Dentistry, 31(5), 441-450.
19. Maran, B. M., Burey, A., de Paris Matos, T., Loguercio, A. D., & Reis, A. (2018). In-office dental bleaching with light vs. without light: A systematic review and meta-analysis. Journal of dentistry, 70, 1-13.
20. Butera, A., Maiorani, C., Rederiene, G., Checchi, S., & Nardi, G. M. (2024). Evaluation of the Effectiveness of Different Types of Professional Tooth Whitening: A Systematic Review. Bioengineering, 11(12), 1178.
21. Takamizawa, T., Aoki, R., Saegusa, M., Hirokane, E., Shoji, M., Yokoyama, M., ... & Miyazaki, M. (2023). Whitening efficacy and tooth sensitivity in a combined in-office and at-home whitening protocol: a randomized controlled clinical trial. Journal of Esthetic and Restorative Dentistry, 35(6), 821-833.
22. Knezović Zlatarić, D., Žagar, M., & Illeš, D. (2019). A clinical study assessing the short-term efficacy of combined in-office/at-home whitening treatment. Journal of esthetic and restorative dentistry, 31(2), 140-146.
23. Cordeiro, D., Toda, C., Hanan, S., Arnhold, L. P., Reis, A., Loguercio, A. D., & Bandeira, M. C. L. (2019). Clinical evaluation of different delivery methods of at-home bleaching gels composed of 10% hydrogen peroxide. Operative dentistry, 44(1), 13-23.
24. Butera, A., Maiorani, C., Rederiene, G., Checchi, S., & Nardi, G. M. (2024). Evaluation of the Effectiveness of Different Types of Professional Tooth Whitening: A Systematic Review. Bioengineering, 11(12), 1178.
25. Takamizawa, T., Muto, R., Suda, S., Kitahara, N., & Miyazaki, M. (2025). Long-Term Whitening Stability in Combined In-Office and At-Home Whitening Protocols: A Randomized Controlled Clinical Trial. Journal of Esthetic and Restorative Dentistry.