

# Attitude of Clinical Dental Students to Bleaching of Vital and Non-Vital Teeth

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## ABSTRACT

**Background:** Bleaching is considered the most conservative and cost-effective aesthetic procedure. Vital and non-vital bleaching techniques commonly involve at-home, in-office, and over-the-counter techniques and can be internal (within the pulp chamber) or external (on the enamel surface).

**Aim:** To assess the attitudes of clinical dental students towards the various aspects of tooth bleaching in Saudi Arabia

**Design and settings:** This is an observational cross-sectional study that was carried out across different universities in Saudi Arabia. The study's questionnaire consisted of questions regarding the demographics and knowledge of dental bleaching procedures, techniques, and materials.

**Results:** A total of 674 dental students and interns from 14 different governmental and private dental colleges in Saudi Arabia completed the survey. The majority of participants were females, 461 (68.4%), attended governmental universities, 396 (58.8%), and did not use any bleaching techniques (62.8%). Dental interns had a higher level of knowledge (42%) followed by 5th-year students (33.7%), and 6th-year students (22.9%). Furthermore, participants who practiced tooth bleaching during clinical training and private universities' students showed a significantly better bleaching knowledge

**Conclusion:** Overall, dental schools should be encouraging their students to be involved in bleaching application. Additionally, there is a pressing need to focus more on dental bleaching material and procedures in dental school.

**Keywords:** Tooth Bleaching, Dental Students, Bleaching Techniques.

## INTRODUCTION

Over the years, people have been continuously occupied with the aesthetics of appearance, including teeth esthetics (i.e., shape and color), where discolored anterior teeth have been often perceived as an esthetic distraction. According to a report released in the UK, 28% of adults have been unsatisfied with the appearance of their teeth. Moreover, around one-third of the adults in the United States were noted to be unsatisfied with their current tooth color.[1] Teeth discoloration can impact a person's self-image, self-confidence, physical attractiveness, and even employability.[2] For these reasons, dental professionals and the public spend considerable amounts of time and money in an attempt to improve the appearance of discolored teeth.[3]

Generally, stains are attributable to aging, ingestion of chromogenic food and drinks, smoking, enamel microcracks, tetracycline, excessive fluoride ingestion, severe neonatal jaundice in infancy, porphyria, dental caries, restorations, and the thinning of the enamel layer.[4] Predisposing factors differ based on the type of stains, intrinsic and extrinsic. Extrinsic stains are usually caused by different lifestyle attributes (e.g., smoking, aging, some foods, or drinks including coffee). These stains can be waned through regular prophylactic measures; however, if these stains become darker and more bothersome, they can be abolished through bleaching.[5] On the flip side, intrinsic stains are more commonly caused by deeper internal stains or enamel defects. Those stains are more resistant to regular prophylactic procedures. Thus, they are

usually reduced by special bleaching agents that penetrate enamel and dentin and oxidize chromogens.[6] Permanent incisors may also discolor following trauma, loss of vitality, endodontic treatment, and restorative procedures.

Thus, teeth bleaching including nonvital teeth has become increasingly important in recent years [7]. Bleaching procedures are more conservative and easier to perform, and less expensive compared to a restorative procedure like veneers. Procedures can be internal (within the pulp chamber) or external (on the enamel surface). Treatment aims to reduce or eliminate discoloration, and to improve the degree of coronal translucency.[8] Bleaching techniques of vital and non-vital teeth commonly involve at-home techniques, in-office procedures, and over-the-counter modalities. Different kinds of bleaching agents are used, such as sodium perborate, hydrogen peroxide, and carbamide peroxide with various concentrations [9]. In-office bleaching (50.9%) was preferred over at-home bleaching in a study reported by ?? . The first-line treatment option of discolored teeth comprises a combination of Sodium perborate with water or Hydrogen peroxide (46.5%) [10]. Bleaching can be manipulated internally on non-vital teeth or externally on vital teeth at home or in-office. Bleaching can be done using carbamide peroxide, hydrogen peroxide or sodium perborate with/without additional light activation.[9] Internal bleaching, however, can be done by thermo-catalytic technique and walking bleach technique. It is worth mentioning that the walking bleach technique is better because of decreased chair-time and its better patient comfortability and safety.[11]

Similar to other pharmaceutical products, bleaching agents are composed of active and inactive ingredients. Inactive ingredients include binding agents, procedures, carriers, surfactants (detergents), coloring dispersants, flavoring, and preservatives; whereas, active ingredients include hydrogen peroxide (3% to 40%) or carbamide peroxide compounds. Although there are dangers, as in all dental procedures, Hydrogen peroxide and carbamide peroxide derived tooth whitening is both safe and efficient when used according to the manufacturer's instructions.

The causes of tooth discoloration are multifactorial with different parts of the tooth taking up different stains. [12] Thus, treatment should be also patient-oriented; that is, it should depend on the form and severity of staining, food patterns, prior restorations, and other intraoral conditions. Additionally, patients should be informed of the potential risks associated with tooth whitening and instructed to describe the adverse reactions when using a home agent. Monitoring of the tooth whitening strategy by an oral healthcare professional is also suggested to minimize the possible risks and maximize the benefits of tooth bleaching.[13] Some adverse effects that were associated with vital tooth bleaching, include tooth sensitivity, gingival irritation, reduced adhesion to dental tissues, and dental structure alterations.[14,15] The occurrence of external root resorption, morphological alterations in dental tissues, alteration of dental materials' properties, and decrease of tooth resistance and adhesion were however reported with non-vital bleaching.[1,16]

This study aimed to assess the attitudes of clinical dental students in Saudi Arabia towards the various aspects of tooth bleaching.

## METHODS

**Study design and settings:** This is a cross-sectional study that has been included dental students and interns from 14 governmental and private dental colleges in Saudi Arabia. This study was approved by the institutional review board from the research center in REU number "SRS/2020/33/215/213".

**Data collection:** Students were provided with an electronic self-paced questionnaire that comprised 11 close-ended questions about their knowledge and experience with teeth bleaching. The questionnaire also included clinical scenarios about an 18-year-old patient presenting with discolored teeth that are endodontically treated, a 32 old pregnant woman requesting vital bleaching for moderately stained anterior teeth, a 24-year-old patient with tetracycline staining requesting a better smile.



**Statistical analysis:** Data were analyzed using the statistical package for the social sciences (SPSS; version 25.0). Descriptive statistics of frequency distribution and percentages were calculated for categorical variables. The Chi-squared test was applied to assess the relationship between categorical variables. A p-value of  $\leq 0.05$  was considered significant.

## RESULTS

A total of 674 dental students and interns completed the survey, where the majority of the participants 461 (68.4%) were females. The majority of participants 396 (58.8%) attended public schools, while the remaining 278 (41.2%) attended private schools. Around 196 (29.1%) of the participants were students of King Khalid University, 127 (18.8%) of them belonged to Riyadh Elm University, 71 (10.6%) were from AlFarabi Colleges, 71 (10.5%) were from other Saudi Arabia universities, and 67 (10%) from Prince Sattam Bin Abdulaziz University.

In this study, 423 (62.8%) of clinical dental students did not perform any bleaching procedure neither for vital nor non-vital teeth. Around two-thirds of the participants, 462 (68.6%), disagreed that bleaching can be considered a good treatment choice for discoloration of teeth resulted from systemic conditions like amelogenesis imperfect. However, around half of the participants, 307 (45.5%), chose the combination of both in-office and at-home bleaching as the favorite protocol to bleach vital teeth (Figure 2).

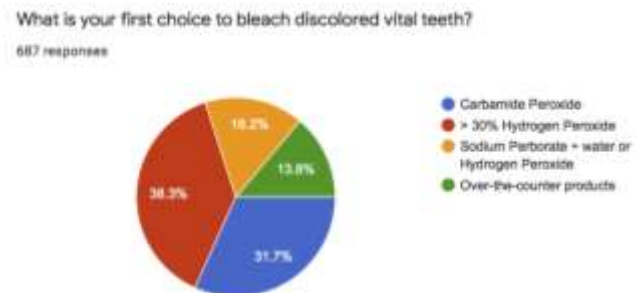


Figure 1 The first choice to bleach discolored vital teeth

The use of a home kit bleaching agent was encouraged by more than half of the patients 396 (58.8%), but only with caution. However, 258 (38.3%) participants chose hydrogen peroxide (concentration >30%) as their primary choice for bleaching discolored vital teeth. For bleaching discolored non-vital teeth, 256 (38%) of participants agreed upon using Sodium Perborate + water or Hydrogen Peroxide as their first choice. Following bleaching, 427 (63.3%) of participants agreed that regular oral hygiene routine at home and personal professional cleanings at the dentist's office, make the results last as long as possible.

As for the bleaching side effects, the majority of participants 494 (73.3%) agreed that root resorption may occur following non-vital bleaching. 574 (85.1%) of participants agreed that there is no effect of bleaching material to bleach the existing restorations such as fillings, veneers, or crowns. To avoid increased sensitivity following

bleaching, 460 (68.2%) of the participants agreed that patients should brush their teeth with a desensitizing toothpaste containing potassium nitrate for two weeks before bleaching. Before non-vital bleaching, 405 (60.1%) of participants proposed using Glass Ionomer as a mechanical cervical seal.

When asked about the three senior cases, 488 (72.4%) participants chose non-vital bleaching with 18% Hydrogen Peroxide as their first choice for bleaching discolored teeth that have been endodontically treated (case 1); 450 (66.7%) of participants chose to delay bleaching until after birth in the case of a pregnant woman demanding vital bleaching for moderately stained anterior teeth (case 2), and more than half of the participants 396 (58.7%) chose vital bleaching and full coverage crowns in the case tetracycline staining (case 3).

A statistically significant difference was found between the different levels of students' knowledge of the materials and techniques of teeth bleaching as well as of clinical case scenarios. Dental interns had more knowledge [283 (42%);  $P = 0.02$ ], followed by [227 (33.7%);  $P = 0.021$ ] for 5<sup>th</sup>-year students, and [154 (22.9%);  $P = 0.001$ ] for 6<sup>th</sup>-year students. Moreover, a significant statistical variation in the knowledge about tooth bleaching between participants who did not practice tooth bleaching during clinical training and those who did, where experienced students tended to have better knowledge. Also, our results showed that there was a statistically significant difference in knowledge between students of private and governmental universities ( $P = 0.025$ ) & ( $P = 0.000$ ), where private universities' students had a higher level of knowledge (Figure 1).

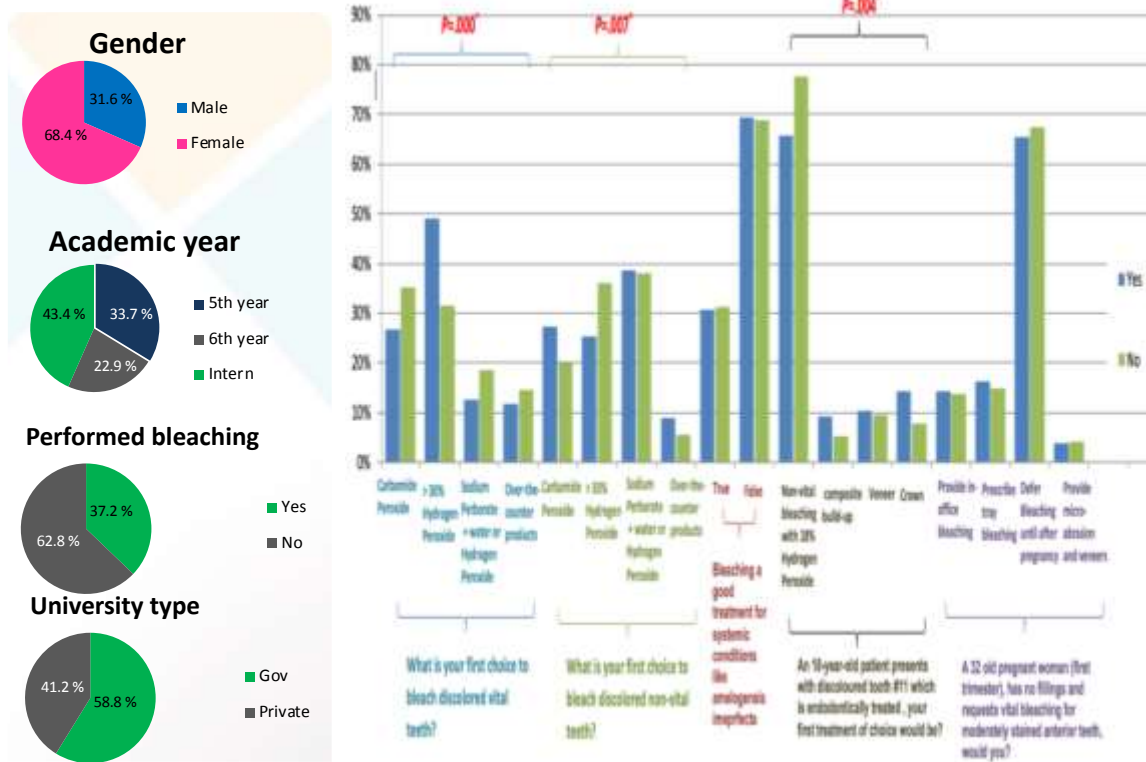


Fig.1 shows the Gender, Academic year, Performed bleaching, University type.

**DISCUSSION**

This study studied the knowledge, attitude, and practice of clinical dental students towards the bleaching of vital and non-vital teeth. Most of the knowledge of observed participants was based on theoretical sessions where only a slight minority applied bleaching techniques.

For bleaching of vital teeth, in-office bleaching using high concentration hydrogen peroxide (25–40%) can be used, where the dentist can stop the procedure once the goal is achieved.[17] However, 10% CP gel with custom-made trays is still considered the gold-standard treatment for tooth discoloration [14,18], and it is the only accepted agent concentration that is accepted by the American Dental Association (ADA) for at-home bleaching. A combination of in-office high-concentration hydrogen

peroxide (35%) dental bleaching and subsequent at-home bleaching with gels form containing 10%, 15%, or 20% of carbamide peroxide is often recommended by some clinicians[19]. Around half of the participants in this study preferred the combination technique. However, according to a study conducted by Tay LY et al., there was no significant difference when the at-home bleaching technique was combined with in-office treatment.[18] More importantly, it is essential to point out the potential impact of bleaching on the pulp tissue precipitated by when applying high concentrations of bleaching gels on vital teeth.[20] Some clinical reports have shown that internal bleaching may result in external root resorption.[8,21] Both the oxidizing agent "30% hydrogen peroxide" and heat can be the causes of resorption. The chemical passes to the

periodontium through the dentinal tubules in the defects of the cemento-enamel junction.[22,23] When heat is applied to this chemical, root resorption occurs. To avoid root resorption, it's preferred to use the mixture of sodium perborate with 30% hydrogen peroxide or distilled water in a ratio of 2:1 [8] Nonetheless, only 38% of the dental students enrolled in this study preferred using Sodium Perborate + water or Hydrogen Peroxide as their first choice.

More than two-thirds of the participants responded that bleaching of tooth discoloration due to Amelogenesis Imperfecta is not considered a good option. This is consistent with the findings of a previous study where this condition was not considered amenable to bleaching, thus, it should be corrected by restorative means.[24]

The majority of the participants (85.1%) believed that the bleaching material does not affect existing restorations. This echoes the current literature's content where there is no previous study that supports the use of bleaching procedures for the correction of discolored dental restoration material; that is, they should be replaced with new ones. Nevertheless, the use of bleaching agents in dental restoration material may result in undesired color change, even when using home-based over-the-counter agents, according to several studies.

It is noteworthy that a high degree of pain and sensitivity of the restored tooth can be accrued in cases where 35% hydrogen peroxide is used for in-office bleaching [25]. In this study, 68.2% of participants assumed that the use of a desensitizing toothpaste containing Potassium Nitrate for the two weeks preceding bleaching to reduce sensitivity. Based on Haywood's study, the use of the potassium nitrate plus fluoride dentifrice, two weeks prior to and throughout bleaching, may prove beneficial for the prevention of bleaching-induced sensitivity [6].

Glass Ionomer was considered as the best material for mechanical cervical seals to be used before non-vital bleaching by around two-thirds (60.1%) of the participants in this study. However, McInerney and Zillich [26] found that Cavit and intermediate restorative material (IRM) provided better internal sealing of the dentin, whereas Hansen-Bayless and Davis. [27] reported that Cavit was a more effective barrier to leakage than IRM. According to Hansen-Bayless and Davis, sealing the root filling with a base is essential to prevent the penetration of bleaching agents for which a variety of dental materials can be used, including—glass-ionomer cements, IRM, hydraulic filling materials (e.g., Cavit, Coltosol).[27]

Our results showed that there was a statistically significant difference in students' knowledge of tooth bleaching material and techniques between participants who did and who did not perform tooth bleaching procedures during the clinical training. Moreover, there was a statistically significant difference in the knowledge of tooth bleaching and the responses to clinical case scenarios between different students' levels (i.e., 5<sup>th</sup>-year versus 6<sup>th</sup>-year versus dental interns) p-values (.02), (.021) & (.001). In the first case about endodontics-related discoloration, 72.4% of the participants chose non-vital bleaching with 18% Hydrogen. Endodontically discolored anterior teeth can be treated through different measures.[2] However, bleaching is deemed more advantageous in

comparison with other conventional options, especially because more conservative.[28] In the second case relating to a pregnant woman, 66.7% of participants decided to defer bleaching until after pregnancy. Because no studies have been done regarding the safety of teeth whitening during pregnancy, the ADA continues to advise that "clinicians may consider recommending that teeth bleaching be deferred during pregnancy" [29]. In the third case regarding tetracycline staining, 58.7% of participants decided to do both vital bleaching and full-coverage crown. According to Jordan and Boksman, tetracycline discoloration has four degrees of severity which decide the best treatment option.[28] Options include bleaching and direct restoration of the discolored area, direct veneer, ceramic laminate veneer, and crowns. Options also differ based on the depth and degree of a discolored tooth.[13] Normally, the bleaching procedure can be effective for the first three degrees, but not effective for the fourth degree.[18]

## CONCLUSION

Overall, the findings of the present study showed that clinical dental students who performed bleaching procedures and dental interns tend to have better knowledge and attitude toward tooth bleaching. Thus, dental schools should be encouraging their students towards non-invasive techniques such as tooth whitening instead of destructive techniques such as veneers or crowns. Universities should also prepare their students to perform the different bleaching procedures during their clinical training to improve their skills and knowledge of tooth bleaching.

### Conflicts of Interest

The authors have no conflicts of interest to declare.

### Source of Funding

This study did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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