LITERATURE REVIEW

IS THE WHITE DIET NECESSARY DURING AND AFTER TOOTH WHITENING? A REVIEW OF THE LITERATURE

A DIETA BRANCA É NECESSÁRIA DURANTE E APÓS O CLAREAMENTO DENTAL? UMA REVISÃO DE LITERATURA

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ABSTRACT

The appreciation of aesthetics has become usual during dental treatment, with tooth whitening being one of the most sought procedures for the treatment of color changes and several authors consider that the white diet is important so that its aesthetic result is not compromised. However, other authors state that the ingestion of food and drinks with dyes does not interfere immediately and later in the result of the bleaching treatment. This article verifies, through literature review, if the white diet is really necessary during or after tooth whitening. A bibliographic search was performed in LILACS and PUBMED, and 16 articles were found that met the inclusion criteria. *In vitro*, *in situ* and *in vivo* studies exposed in this work report that there is no interference of pigments during bleaching on the result of the procedure. There is also a consensus that after the bleaching treatment, red wine interferes with color maintenance. Therefore, indicating the white diet is still a recommendation that is partially not based on scientific evidence, due to the lack of congruence in research results.

Keywords: Tooth whitening, tooth discoloration, pigmentation.

RESUMO

A valorização da estética tornou-se usual durante o tratamento odontológico, sendo o clareamento dental um dos procedimentos mais procurados para o tratamento de alterações na cor e diversos autores consideram que a dieta branca é importante para que o seu resultado estético não seja comprometido. Porém, outros autores afirmam que a ingestão de alimentos e de bebidas com corantes não interfere imediatamente e posteriormente no resultado do tratamento clareador. Este artigo verifica, por meio de revisão de literatura, se a dieta branca é realmente necessária durante ou após o clareamento dental. Foi realizado um levantamento bibliográfico nas bases LILACS e PUBMED, sendo encontrados 16 artigos que se enquadravam nos critérios de inclusão. Estudos *in vitro*, *in situ* e *in vivo* expostos nesse trabalho, relatam que não há interferência dos pigmentos durante o clareamento no resultado do procedimento. Há consenso também de que após o tratamento clareador, o vinho tinto interfere na manutenção da cor. Portanto, indicar a dieta branca ainda é uma recomendação que parcialmente não é baseada em evidências científicas, devido à falta de congruência nos resultados das pesquisas.

Palavras-chave: Clareamento dental, descoloração de dente, pigmentação.

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INTRODUCTION

The appreciation of aesthetics has become more and more usual by patients during dental treatment (1). Among the aesthetic concerns, the tooth color is one of the most reported, related to self-esteem and quality of life (2,3,4). In addition, whitened teeth have been attributed to more positive judgments about personality traits, such as competence and social appeal, intellectual ability, and relationship satisfaction (5).

The teeth color alteration can occur due to intrinsic factors and extrinsic factors (6). The tooth pigmentation caused by intrinsic factors may be the result of a range of factors, such as changes during tooth formation, systemic diseases, dental trauma, fluorosis and dental aging (6). The change caused by extrinsic factors can occur due to tobacco use, biofilm accumulation, use of drugs such as chlorhexidine and mainly through the ingestion of foods and beverages that have dyes in high concentrations such as coffee, red wine and cola-based soft drinks. (6,7,8). Correctly identifying the cause of the change in tooth color is essential to achieve and maintain a satisfactory result in the bleaching treatment (9).

Thus, the search for tooth whitening has become popular not only because of its range of indications for cases of altered tooth color, but also because it is a quick, minimally invasive, safe, and effective procedure (10).

During and after the whitening treatment, regardless of the technique used, the main question concerning the care that must be taken is about the use of drinks and foods that have dyes. Dentists commonly advise their patients to avoid foods and drinks with a high concentration of dyes, in order to obtain a satisfactory and lasting result (11). Several authors still consider that the white diet (diet without the ingestion of food and beverages with dyes) is important for the success of tooth whitening, so that the aesthetic result is not compromised (8,11,12,13). However, other authors state that the ingestion of food and beverages with dyes does not compromise the result (9,14,15,16). Thus, the aim of this study is to verify, through a bibliographic survey, if the white diet is truly necessary during or after tooth whitening.

LITERATURE REVIEW

A qualitative and bibliographic research was conducted on scientific articles about the use of the white diet during or after tooth whitening. The bibliographical survey was carried out in databases, such as Latin American and Caribbean Literature on Health Sciences (LILACS) and MEDLINE - Online System for Search and Analysis of Medical Literature, using the following Descriptors in Health Sciences (DeCS), registered in the Virtual Health Library (VHL) site: “Tooth whitening, tooth discoloration, pigmentation” in Portuguese and “Tooth whitening, tooth discoloration, pigmentation” in English. The search was made by combining the descriptors, using connectives such as “e/ou” in Portuguese and “and/or” in English. Inclusion criteria were full articles in Portuguese and English, published between 2008 and 2021. The exclusion criteria were publications that did not address the central theme of the study and publications in languages other than Portuguese or English. A total of 16 studies were selected, categorized in this review according to study design: *in vitro, in situ* or *in vivo*. Other publications were added for contextualization purposes and to suggest new studies.

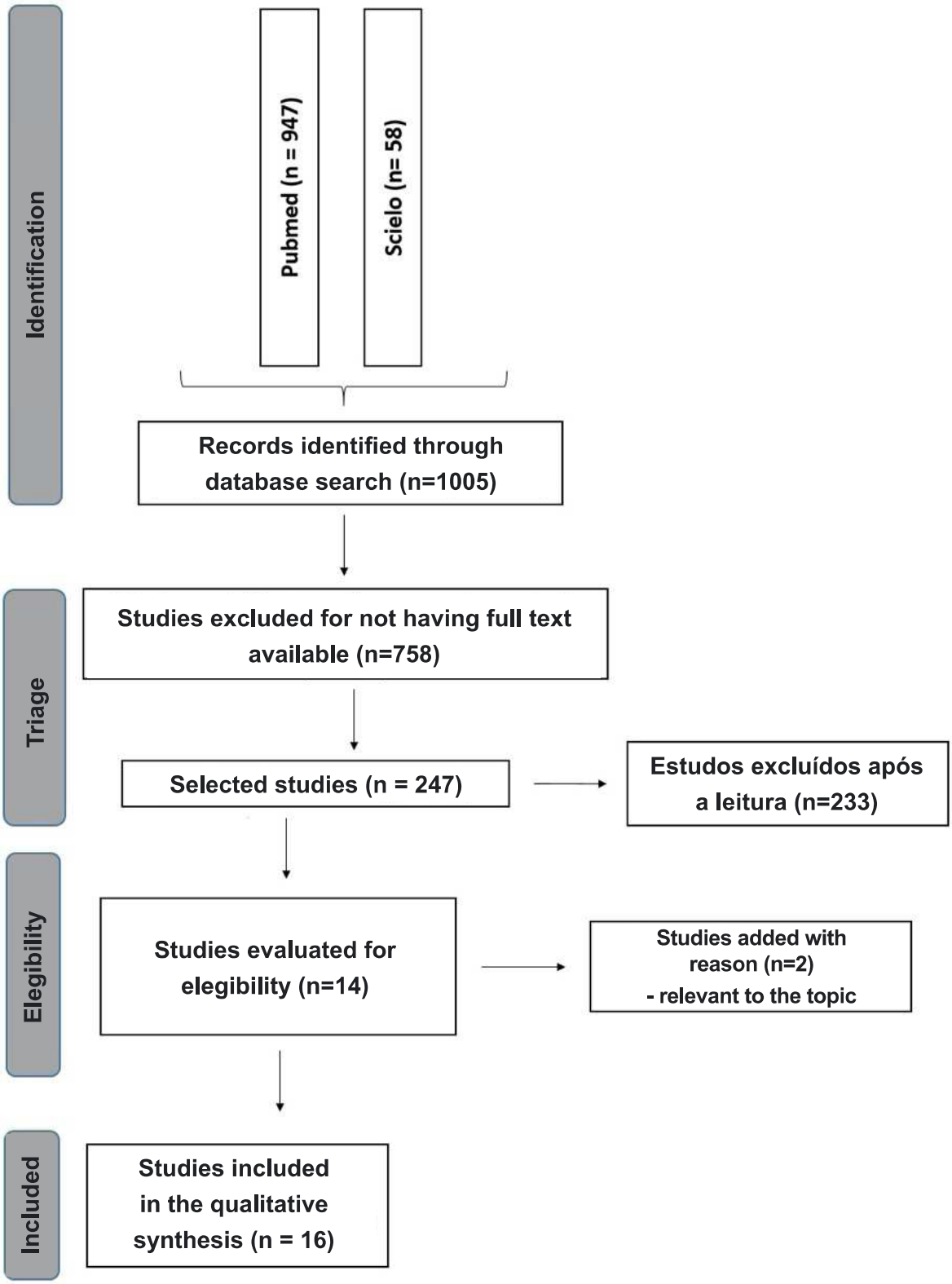

Figure 1. *Flow chart of the study.*

In vitro studies

Caneppele et al. bleached bovine incisors with 16% carbamide peroxide and divided them into 4 groups, which were soaked in coffee, wine or cola beverage for 5 minutes, twice a day. The control group was not submitted to imbibition in dyes. All teeth were kept in artificial saliva during the intervals of the experiment. At the end, the colorimetric values were obtained with the aid of a clinical spectrophotometer. There was no significant difference regarding the result of the bleaching treatment between the evaluated groups (14). Another study evaluating bovine teeth, 16% carbamide peroxide and coffee immersion (control group without immersion, experimental group immediately after bleaching and another experimental group 4 hours after) also observed no statistical difference between the evaluated groups (15). Another study evaluating bovine teeth, 16% carbamide peroxide and coffee immersion (control group without immersion, experimental group immediately after bleaching and another experimental group 4 hours later) also did not observe any statistical difference between the evaluated groups (15). Claudino et al. also did not observe any influence of pigmenting agents in bovine dental enamel on the result of immediate tooth whitening. This study evaluated the bleaching with hydrogen peroxide 35% in bovine teeth immersed for 15 minutes in distilled water, coffee, cola-based soft drink, wine, mate tea and industrialized açaí between bleaching sessions, which consisted of 3 applications of 15 minutes every 7 days for a total period of 21 days (17).

When evaluating the immersion of human premolars in distilled water, coffee, coffee with sugar, black tea, black tea with sugar, grape juice and grape juice with sugar, Rezende et al. observed no statistically significant difference between groups. The authors used 16% carbamide peroxide for 3 hours daily for 3 weeks and immersed the experimental groups for 5 minutes 3 times a day, and one of these exposures was performed immediately after tooth whitening. After 5 minutes of immersion in the staining solutions, the specimens were stored in artificial saliva at 37oC in an oven. In this study, home tooth whitening was effective even in the presence of food stains, regardless of the presence of sugar (16).

Correia et al. evaluated the effect of pigmenting agents on the color stability of bovine enamel fragments during tooth whitening. The blocks were divided into 7 groups: distilled water (control), coffee, cola, tea, red wine, chocolate milk and soy sauce. The 22% carbamide peroxide was applied for 1 hour a day for 14 days. After bleaching, teeth were exposed to solutions for 5 minutes. During the experiment, the samples were stored in distilled water. The color was evaluated before and after whitening (day 1 and 14) using a spectrophotometer. Only soy sauce promoted staining on whitened enamel while the other substances did not interfere with the tooth whitening treatment (9).

On the other hand, Azer et al. observed a statistically significant difference between teeth in the control group (immersed in neutral buffer solution) and teeth immersed in neutral buffer solution with red food coloring. The authors tested 20% carbamide peroxide bleach for 10h and immersion in the solution for 4h in recently extracted human molars and suggested that it may be beneficial to avoid highly pigmented foods immediately after bleaching (12).

Cortes et al. evaluated the influence of coffee and wine on human molar blocks obtained by bleaching treatment with 10%, 15% or 20% carbamide peroxide. The immersion in the solutions was performed for 15 minutes per day. The evaluation was done by spectrophotometer 3 times a week during the bleaching (22 days), and after the treatment for 7, 15 and 30 days. There was no difference between groups during the bleaching (different concentrations and different solutions). However, after bleaching, there were statistically significant differences between the groups immersed in coffee (day 30) and wine (day 7 and 30) in comparison with the control (13).

Another study used extracted human central incisors that were bleached with 10% carbamide peroxide for 6 hours a day for 2 weeks and in the intervals of the procedure, stored in artificial saliva at 37oC. After bleaching, the samples were divided into 5 groups according to the staining solution: artificial saliva (control group), red wine, coffee, cola-based soft drink and tea, and immersed for 15 minutes, 6 hours, one week and one month. No statistical differences were observed between the coffee and the control group, regardless of immersion time. The other groups showed a statistically significant difference with the control group. The cola-based soft drink presented the highest values after one week and one month of immersion (18).

Liporoni et al. evaluated bovine enamel fragments treated with 35% hydrogen peroxide and immersed 30 minutes or 150 minutes after bleaching in coffee and red wine. The authors also observed that coffee did not interfere with the bleaching result, although bovine enamel changed when immersed in red wine, regardless of the exposure time after bleaching (19).

Another study that observed changes in pigmented solutions after bleaching was conducted by Neri et al. Healthy human molars, sectioned in fragments, received bleaching treatment with hydrogen peroxide for 45 minutes, and the protocol was repeated 3 times. After bleaching, the specimens were immersed for 6 hours a day for 30 days. During the immersion

intervals, the specimens were kept in artificial saliva. The study showed that cola-based soft drinks, red wine, açai juice, coffee and black beer interfere in the stability of the whitened enamel color (20).

The action of fitness drinks (açaí, pink, green, yellow detox juices or water) in immersion for 1 hour daily in bleaching solution with hydrogen peroxide 35% in bovine enamel was evaluated in the study of Amorieli et al. The teeth that presented a difference in color change were the whitened teeth submitted to artificial aging with yellow and pink detox juice. On the other hand, the teeth that were not whitened had a greater change in color when submitted to the pink, açaí and green detox juices (8).

In situ studies

Fragments of bovine teeth were mounted in intraoral devices, submitted to tooth bleaching with 10% carbamide peroxide for 14 days and immersion in colored beverages for 10 minutes daily. The samples were divided into control (no bleaching + distilled water), positive control (bleaching + distilled water), bleaching + coffee, bleaching + grape juice. Volunteers used the device continuously, except during meals, oral hygiene, tooth whitening and pigment immersion. Evaluations were performed by spectrophotometer before whitening, on day 7 and on day 14. The treatment result was not affected by the immersion of the different substances, although it had influenced the different color dimensions: brightness and value (21).

Mori *et al.* evaluated human dental fragments mounted in intraoral devices bleached with 35% hydrogen peroxide and treated without contact with coffee, immersion in coffee solution for 30 minutes daily for 7 days, starting 1 week after bleaching and immersion in coffee solution for 30 minutes daily for 14 days, starting immediately after bleaching. The bleaching treatment was not affected by the daily exposure to coffee. The authors attribute the absence of difference between the groups to enamel remineralization due to contact with saliva (22).

In vivo studies

Rezende *et al*. evaluated 40 patients, dividing them into a control group (no intake of coffee and restricted intake of food with dyes) and an experimental group (consumption of coffee at least twice a day, performing 30-second mouth rinses 4 times a day and no food restriction). Both groups received a bleaching treatment with 16% carbamide peroxide for 3 hours daily for 3 weeks. The color was evaluated visually using the VITA scale and by spectrophotometer. Coffee exposure and non-white diet did not affect the degree of whitening compared to the control group (23).

Hass *et al.* performed whitening treatment with 35% hydrogen peroxide in 2 sessions with 3 applications of 15 minutes in 44 people, divided into a control group (no cola-based soda intake) and an experimental group (intake at least twice a day). Color was assessed visually using the VITA scale and spectrophotometer. The authors observed that exposure to cola-based soft drinks during in-office whitening treatments did not affect bleaching efficacy, even after 30 days of treatment (24).

Matis *et al.* evaluated five publications of in vivo studies that did not impose dietary restrictions. Patients answered questionnaires, being distinguished by whether or not they followed a white diet (consumption of coffee, tea, wine or dark fruits). It was observed that there was no interference in the bleaching result between the groups evaluated during the treatment (25).

DISCUSSION

This review included 16 articles with different methodologies, most of them *in vitro*, with only two articles presenting an *in situ* study design and three articles with an *in vivo* methodology.

Based on the *in vitro* studies, there was a difference in the conclusion of the results obtained between them. The discrepancy can be attributed to the immersion time of the stained solution of the experimental group (4 hours) in relation to 5 minutes of immersion in the study by Caneppele *et al.* and in the study by Rezende *et al*., and 15 minutes in the study by Camara *et al*. and Claudino *et al.* Moreover, despite not agreeing regard the coffee results, all the mentioned studies showed significant differences in the evaluation after bleaching in relation to wine and the control group (absence of pigment solution).

It was observed that several studies have evaluated the effect of colored beverages, such as wine, tea, coffee and soda, due to their high rate of consumption and because they are present in the diet of most of the patients. *In vitro*, *in situ* and *in vivo* studies exposed in this work, report no interference of pigments during bleaching in the result of the procedure. There is also a consensus that after the bleaching treatment, red wine interferes in the maintenance of the color. However, the other solutions and foods showed different results that may be due to different concentrations of pigments in the solutions and foods. This argument can also be hypothesized by the fact that solutions have different pH, and the more acidic (such as, for example, wine) the drink is, the greater is the degree of staining produced in the tooth structure when compared to substances with less acidic pH. (22).

This literature review also draws attention to the scarcity of studies in the form of a systematic

review, since this study is an important resource for the synthesis of scientific evidence, helping clinical professionals and researchers in their daily work. In addition, there is a scarcity of *in situ* and *in vivo* studies, with a predominance of *in vitro* studies. Another point that needs to be highlighted is the negative influence of electronic media and social networks, guiding and recommending dental products by individuals without professional legal registration or consent of the dentist.

In vitro studies have shown that the action of bleaching agents can interfere with enamel morphology, and when associated with the consumption of acidic beverages and tooth brushing, can cause severe damage to tooth structure (26-28). Another important aspect is a thin, inorganic, bacteria-free layer that forms under the enamel surface, protecting against acidic challenges. If the individual does not have adequate salivary flow, the acidic diet could modify enamel morphology and result in loss of outcome and/or longevity of tooth whitening. Therefore, further studies are needed to elucidate whether these and other factors may contribute to or exacerbate surface pigmentation during or after this procedure.

CONCLUSION

In vitro, *in situ* and *in vivo* studies exposed in this work, report no interference of the pigments during the bleaching in the result of the procedure. Though, there is a consensus that after the bleaching treatment, red wine interferes in the maintenance of the color. Thus, we conclude that there are still differences in the literature, and more studies must be conducted, especially systematic reviews compparing different methodologies. Still, indicating the white diet is a recommendation that is partially not based on scientific evidence, due to the lack of congruence in research results.

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