



# One-year follow-up of at-home bleaching in smokers before and after dental prophylaxis



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## ABSTRACT

**Objective:** This clinical study evaluated the color longevity after one-year of at-home bleaching with 10% carbamide peroxide (CP) in smokers and nonsmokers.

**Methods:** Sixty patients, 30 smokers and 30 non-smokers were subjected to bleaching with 10% CP during three hours daily for three weeks. The color was measured at baseline and one week, one month and one year after the completion of dental bleaching using the spectrophotometer Vita Easyshade ( $\Delta E^*$ ), shade guide Vita classical organized by value and Vita Bleachedguide 3D-MASTER ( $\Delta SGU$ ). In the one-year recall, the color was assessed before and after dental prophylaxis with Robinson brush and prophylaxis paste. Data from color evaluation were analyzed by two-way repeated measures ANOVA and Tukey's test for the contrast of means ( $\alpha = 0.05$ ).

**Results:** Twenty-seven smokers and 28 non-smokers attended the one-year recall. For both study groups, only the main factor assessment time was statistically significant for  $\Delta SGU$  (Vita classical) and  $\Delta E^*$  ( $p < 0.001$ ). Effective whitening was observed for both groups at baseline, which was stable at one-month and one year after dental prophylaxis. A slight darkening was observed after one year when the color was measured without prophylaxis. For the Vita Bleachedguide 3D-MASTER, color rebound was observed irrespectively of dental prophylaxis.

**Conclusion:** The bleaching with 10% CP remained stable in both groups as long as extrinsic stains from diet and cigarette smoke were removed by professional dental prophylaxis. Clinical trials registry: NCT02017873.

**Clinical relevance:** The results of this study indicate that the bleaching is effective in smokers even after one-year, but dental prophylaxis may be necessary to remove extrinsic stains caused by diet and smoking.

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## 1. Introduction

Currently, people give much value to the body and aesthetics. A large number of people wish not only to have a perfect body, but also a perfect smile [1]. In this context, smokers are likely good candidates for cosmetic dental procedures since the prevalence of self-assessed tooth discoloration in smokers is almost twice that reported by non-smokers [2]. They represent a significant portion of the population, since there are around 1.2 billion smokers in the world [3].

Unfortunately, clinical trials of bleaching agents usually exclude smokers from their clinical trials [4–13], which prevent us from assessing the feasibility of this cosmetic procedure in such patients. An earlier publication of de Geus et al. [14] demonstrated that effective whitening is achieved regardless of whether the patient is a smoker. It was reported that the magnitude of color change after at-home whitening is equivalent between smokers and non-smokers at one week [14]; however this equivalence was not seen one month after bleaching, with smokers having slightly darker teeth than non-smokers. This situation may be even more evident after some months as cigarette smoke deposits a dark extrinsic stain on the dental surface [2,15]. However, to the extent of our knowledge, no clinical study has evaluated the longevity of at-home bleaching in smokers.

Apart from that, we should be able to diagnose if the color rebound results from the deposition of dyes or smoke on the dental

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surface or from the reversal of the oxidizing action of the bleaching agent or dentin deposition over time. Therefore, the evaluation of the “real” whitening outcome in long-term recalls would require color assessment before and after removal of extrinsic staining by mechanical cleaning and dental prophylaxis [16].

Although there are numerous studies of at-home dental bleaching, only a few of them evaluate the color stability over time [7,8,17–24]. None of these studies have attempted to appraise the bleaching longevity after dental prophylaxis. Therefore, the aim of this controlled clinical trial was to compare the one-year color change of at-home bleaching in smokers and non-smokers before and after dental prophylaxis. The following null hypotheses will be tested in this study: (1) no difference in color change of teeth will be observed between the immediate and one-year results for both study groups; (2) the color change before and after dental prophylaxis will be the same for both study groups.

## 2. Methods

The State University of Ponta Grossa (protocol 669.914/2014) and the Ethic Committee approved this equivalence clinical trial. This study is the one-year follow-up of an earlier study [14] registered at the clinicaltrials.gov under the identification number of NCT02017873. This earlier study was conducted in the Chile and Brazil centers [14], but the follow-up was only performed in the Brazilians participants. We have followed the recommendation of the STROBE checklist (Strengthening the Reporting of Observational studies in Epidemiology) for the report of this study.

### 2.1. Bleaching procedure

We asked the participants who met the inclusion criteria about their daily smoking habits. Those who did not smoke were part of the group of non-smokers, and those who smoked at least 10 cigarettes per day belonged to the group of smokers. We included 30 participants in each group.

We made alginate impressions of each participant’s maxillary and mandibular arch and poured the impressions with dental stone. We did not apply block-out material to the labial surfaces of the teeth [25]. We used a 1-millimeter-thick soft vinyl material provided by the manufacturer (Whiteness, FGM Dental Products) to fabricate the custom-fitted tray to hold the bleaching gel. We trimmed the bleaching tray one mm beyond the marginal gingiva and delivered the tray and the 10% CP gel (Whiteness Perfect, FGM Dental Products) to each participant with oral instructions for use. We instructed all participants to wear the tray with the bleaching agent for 3 h daily for 3 weeks.

We instructed the participants to remove the tray after the daily bleaching period, wash it with water, and brush their teeth as usual. We also provided verbal instructions about oral hygiene, encouraging participants to brush their teeth regularly with fluoridated toothpastes without whitening components.

### 2.2. Sample size

This study is the one-year follow-up of an earlier study [14]. We based the sample size calculation on the color change measured with the spectrophotometer, the primary outcome of this study.

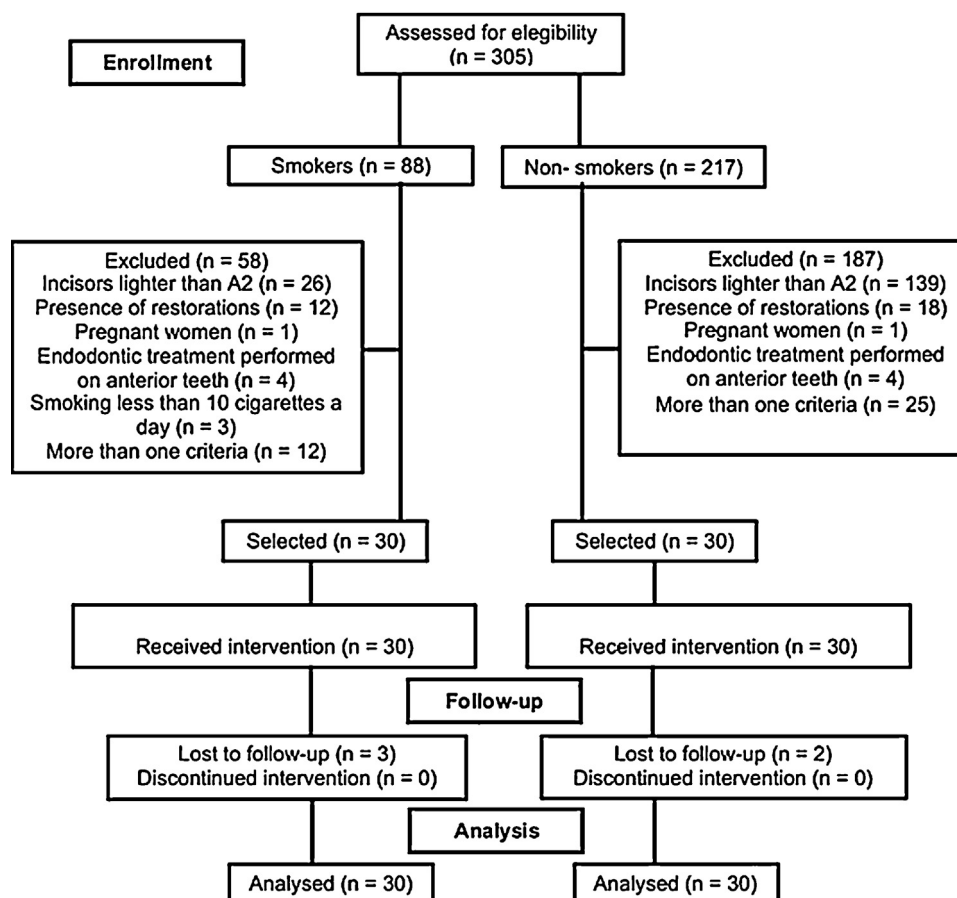


Fig. 1. Flow diagram of the clinical trial, including detailed information regarding the excluded participants.

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