

Efficacy of Natural Oils on Tooth Whitening: An *In Vitro* Study

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Abstract

Objectives: The aim of the study is to compare the effect of different natural sources on teeth whitening.

Materials and Methods: Sound (48) extracted human teeth distributed into four experimental and two control groups. Each group of 8 teeth placed in a plastic tube containing 15 ml of phosphate-buffered saline and 15 ml of tested material. Group 1 contained (15g) of turmeric. Groups 2,3 and 4 contained 15 ml of commercially available sunflower, coconut, and sesame oils respectively. For positive control group 30 ml of 9% (H₂O₂) was used, while 30 ml of saline used as a negative control group. Tubes placed on a rotating platform shaker for 20 minutes. Teeth are washed with saline and stored at room temperature overnight. The procedure was repeated two times a day for 7 days. Shade was determined for one crown surface using Vita Classical and Vitapan 3D- Master before and after using the rinses.

Results: Difference in means was tested using analysis of variance (ANOVA) followed by Tukey's post hoc and independent sample t- test as necessary. Analysis was performed using the Statistical Package for Social Science version 17 (SPSS INC Chicago link). All statistical tests were two-sided, and the significance level was set at $p < 0.05$.

Conclusion: Regardless of the oral beneficial of coconut, sesame oils and turmeric the study shows no evidence suggest these products has role in teeth whitening. Sunflower oil shows significant improvement when compared to other oils. Further studies recommended to assess non-evidence-based teeth whitening methods.

Keywords: *Natural Oils; Tooth Whitening; Sesame Oils*

Introduction

Teeth discoloration can be extrinsic, intrinsic or combination of both, intrinsic discoloration due to merge of chromatogenic material to the enamel and dentin after eruption of the teeth or during odontogenesis. The main cause for intrinsic discoloration after eruption of the teeth pulp necrosis, aging and iatrogenesis. Pre eruption discoloration could happened due to inherited developmental disorders and trauma to the developing tooth [1]. People throughout history, invent ways to whiten and clean teeth. Started 5,000 years ago, by using a primitive toothbrush, form it into a brush-like shape by chewing on one end of a twig. Since 2000 years ago different teeth cleaning methods were used like ground bone, eggshells and ground seashells which used as primary cleaning component [2]. Teeth color and aesthetic of the teeth become high demand of patient, according to which reported in UK 28% of adults are not satisfied with the of their teeth appearance as well is what reported in USA 34% of an adult population are not satisfied with their tooth color [3,4]. Teeth Influence of media as well as advertising of oral care products companies enhance dental esthetic demand especially teeth whitening [5]. Carbamide

peroxide 10% home bleaching considers most commonly used method for vital teeth whitening which uses at night almost 2 to 5 weeks. Which have many advantages like including less concentration of peroxide easy to apply less time-consuming in the dental office and lower cost [6-8]. Recently oil pulling initiates attention as a way to promote oral health. Oil pulling is a dental technique which includes swishing a spoon of oil like sesame, coconut, or sunflower, in the mouth for about 20 minutes on an empty stomach. Oil pulling has been used as a traditional Indian folk to prevent unpleasant odor, dental caries strengthening the teeth, gingiva, and jaw, treat gingival inflammation and cracked lips [9,10]. Several websites said there is evidence and personal trial of the use of oil pulling as a natural way to whiten teeth, even with some dental professionals advocating its use as an adjunct to regular dental care [11].

Aim of the Study

The aim of the study is to compare the effect of different natural sources (turmeric, sunflower oil, coconut oil, and sesame oils) on teeth whitening.

Materials and Methods

A sound (48) human premolars extracted for orthodontic treatment was collected, cleaned from gross debris and stored in saline at room temperature. The collected teeth had intact enamel crown with no restorations. The teeth were thoroughly cleaned and washed in ethanol prior to use.

The teeth was distributed randomly into six groups “four experimental groups, and two control groups”. Each group consist of 8 teeth as shown in table 1. The initial tooth shade was determined for one crown surface using a VITA Easyshade® Compact, vita classical and 3D Master. Each group of 8 teeth placed in plastic tube containing 15 ml of phosphate-buffered saline and 15 ml of tested material. In group 1 saline was mixed with (15g) of turmeric. Groups 3,4 and 5 contained 15 ml of commercially available sunflower, coconut and sesame oils respectively. Coconut oil was heated at 37°C in order to mix it with the saline. 30 ml of 9% hydrogen peroxide (H₂O₂) was used for positive control group. For negative control group 30 ml of saline was used. In order to simulate rinsing action inside oral cavity, the tubes placed in a rotating platform shaker for 20 minutes. The solution then is depleted and the teeth is washed 3 times with saline. The tubes then stored at room temperature overnight. This procedure was repeated two times a day for 7 days. The tooth shade measurement was carried on the crown surface of concern after by using a VITA Easyshade® Compact, vita classical and 3D Master. The data obtained was statistically analyzed.

	No. of teeth	Group Description
Group- I “Tur”	8	15 ml of phosphate-buffered saline + (15g) of turmeric
Group-II “Sun”	8	15 ml of phosphate-buffered saline + 15 ml of commercially available sunflower oil
Group-III “Coc”	8	15 ml of phosphate-buffered saline + 15 ml of commercially available coconut oil
Group-IV “Ses”	8	15 ml of phosphate-buffered saline + 15 ml of commercially available sesame oil
Group-V “H ₂ O ₂ ”	8	positive control teeth were treated with 30 ml of 9% hydrogen peroxide (H ₂ O ₂).
Group-VI Saline	8	As negative control one group of teeth were treated with 30 ml of saline only.

Table 1: The tested groups in the study.

For 1 liter of 1X phosphate-buffered saline (PBS), prepare as follows:

1. Start with 800 ml of distilled water:
2. Add 8g of NaCl.

3. Add 0.2g of KCl.
4. Add 1.44g of Na_2HPO_4 .
5. Add 0.24g of KH_2PO_4 .
6. Adjust the pH to 7.4 with HCl.
7. Add distilled water to a total volume of 1 liter.

Results

In order to evaluate the outcome of experiment, the vita shade were arranged from the most light to the least light, then each shade numbered according to the Munsell color ranking system B1 (16), A1 (15), B2 (14), D2 (13), A2 (12), C1 (11), C2 (10), D4 (9), A3 (8), D3 (7), B3 (6), A3.5 (5), B4 (4), C3 (3), A4 (2) and C4 (1). The shade improvement was assessed using VITA Easysshade® Compact, vita classical and 3D Master.

In Hydrogen Peroxide (Positive control) group, according to vita classic there was improve in shade from 3 to 6 in six teeth, there was no improvement in 2 teeth. According to 3D-Master, all teeth improved in Chroma. Improve in value was observed in three teeth, while 4 teeth showed improve in Hue.

In Sunflower oil group, only one tooth showed improve according to vita classic by 2 shades, which is the same tooth improved in value. Only one tooth improved in Chroma and one tooth improved in Hue.

Two teeth in Sesame group improved by 1 shade, while 2 teeth improved in value and one improved in Chroma.

The shade Improvement measurement reveled no changes on shade, Value, Hue and Chroma in Coconut, Turmeric and saline (negative control) groups. Statistical analysis of the results obtained was done using Wilcoxon signed rank test (for before and after comparison) and Kruskal wallis test (for intragroup comparison) and significance set at $p < 0.05$.

Medium	Numbers	Before, Mean	After, Mean	t-test p value
Hydrogen peroxide	8	5.6	3.1	0.03
Sunflower oil	8	6.5	6.3	1.12
Sesame Oil	8	8.1	7.3	0.07
Coconut Oil	8	8.3	8.3	1.1
Turmeric	8	7.6	7.6	1.1
Saline	8	8.6	8.6	1.1
ANOVA F value		9.78	19.17	
ANOVA P value		0.04	0.0001	
TUKEY POST HOC		Saline > Hydrogen peroxide (HP), Coconut oil > HP, sesame oil > HP	Saline > Hydrogen peroxide (HP), Coconut oil > HP, Turmeric > HP, sesame oil > HP, Sun flower oil > HP	

Table 2: Comparison of mean values with different media under VITA classic shade.

Medium	Numbers	Before, Mean	After, Mean	t-test p value
Hydrogen peroxide	8	7.3	4.5	0.03
Sunflower oil	8	7.6	7.1	1.13
Sesame Oil	8	11.8	10.5	0.09
Coconut Oil	8	11	11	1.1
Turmeric	8	10.8	10.8	1.1
Saline	8	11.1	11.1	1.1
ANOVA F value		10.9	18.13	
ANOVA P value		0.03	0.0001	
TUKEY POST HOC		Coconut oil > HP, sesame oil > HP, Saline > HP	Coconut oil > HP, sesame oil > HP, Saline > HP, Turmeric > HP,	

Table 3: Comparison of mean values with different media under 3D shade guide.

Discussion

several studies suggested that oil pulling has a beneficial effect on the oral cavity, it can reduce gingivitis, oral plaque, and halitosis [11-13]. Due to the presence of high amounts of polyunsaturated fatty acids in sesame oil, thereby reducing free radical injury to the oral tissues [14-16]. Oil pulling considers as Indian folk remedy which has multiple effects on oral cavities like preventing oral malodor, tooth decay, dryness of throat, bleeding gums, and cracked lips, and for enhancing the strength of the gum, teeth, and jaws [17,18]. According to A randomized, controlled, triple-blind study conducted in Indian oil pulling has a role in preventing oral diseases and improving oral health [11]. This is the first study that compared the effect of turmeric with hydrogen peroxide in teeth whitening. According to some anecdotal evidence, oil pulling has role in teeth whitening. *In vitro* study, value-oriented shade guides were used for distinguished of color changes in a set of extracted teeth treated with the three most common oils used in oil pulling. Which consider as a valid method to differentiating between dark and light colors which has a good reliability [19]. The result of the study can compare with a published study which concludes with that the oil pulling has no appreciable teeth whitening effect. Google search show self-reports and many articles suggest oil pulling lead to teeth whitening, none of these studies are showing scientific evidence. Although experimental conditions in the ongoing study were planned to simulate the physical action of oil in the oral cavity, it can be a dispute that *in vitro* studies cannot completely simulate the *in vivo* conditions. Repeated sesame oil pulling caused lipid pneumonia in two cases [20]. Kim JY, *et al.* [21] suggest that Patients who live in regions where sesame oil pulling consider as a popular custom they have the possibility of getting lipid pneumonia. In another study women with recurrent lipid pneumonia symptom resolve after stopping oil pulling [21]. Due to several reports that suggest pulling-induced lipid pneumonia, it considers not ethically to perform the experiment on a human. Websites include different methods of teeth whitening like apple cider vinegar, baking soda, strawberries and lemon peel. Used of mixed strawberries and baking soda found to be inefficient methods of at home teeth whitening [22]. Further research and studies must be done to ensure the safety and efficacy of the product [23].

Conclusion

Regardless of the oral beneficial of coconut, sesame oils and turmeric the study shows no evidence suggest these products has role in teeth whitening. Sunflower oil shows significant improvement when compared to other oils. Further studies recommended to assess non-evidence-based teeth whitening methods.

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