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Original Research

Evaluation Of The Effect Of Two Herbal Decoctions Nilavembu Kashayam And Kabasura Kudineer On The Colour Stability Of Bleached Teeth - An In Vitro Study

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Abstract

Introduction: Teeth whitening procedures are performed by most dental professionals to overcome tooth discolouration. Increase in surface roughness of the enamel post bleaching reverses the aesthetic appearance of the tooth. Some classic reasons for the above are beverages, tobacco and smoking. During this covid-19 pandemic, herbal drinks with medicinal values have been recommended by the government. Two most widely accepted among them in Tamilnadu are Nilavembu kashayam and Kabasura kudineer. These are consumed by most of the people regularly in the battle against this covid-19 virus. These herbal concoctions can also have staining effects on bleached teeth. The study aimed at evaluating the effect of Nilavembu kashayam and Kabasura kudineer on the stability of colour on bleached teeth.
Materials and Method: 35% hydrogen peroxide are used to bleach 30 human central incisors (SDI, Pola in-office kit central incisors (SDI) were separated into three groups. Groups 1 and 2 were immersed in Kabasura kudineer, while Group 3 was submerged in distilled water (control). Colour variation (e) was calculated using Kabasura kudineer the CIE-Lab system using the values (l*), (a*), and (b*). The samples were then submerged for 8 minutes, every 24 hours, for three days, in Kabasura kudineer and Nilavembu kashayam. After immersion, all of the samples' spectrophotometric readings (l*, a*, and b*) were recorded. For statistical analysis, one-way ANOVA and the Tukey Post Hoc test were utilised (p-value 0.01).
Result: The groups that were immersed in test samples showed differences in colour. Groups 1 and 3 were followed by Group 2 in terms of colour variety. The average colour variation difference between group 2 and group 1 was 3.91.
Conclusion: Within the limitations of the current study, it was found that Nilavembu kashayam has more potential to cause discolouration in bleached teeth followed by Kabasura kudineer.

Keywords: *Teeth Whitening; Hydrogen peroxide; Nilavembu kashayam; Kabasura kudineer; Discolouration.*

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INTRODUCTION

Changing the colour, alignment, placement, and size of teeth are all included in the developing area of dental aesthetics [1]. It is a branch of dentistry with a focus on patient aesthetic enhancement. One such conservative and affordable aesthetic technique is tooth whitening, which uses hydrogen peroxide or carbamide peroxide on stained teeth to produce an attractive smile [2]. Dr. James Truman invented the first method for whitening stained teeth in 1864 [3]. In contrast to crowns and veneers, which return the teeth to their natural colour, bleaching has a shorter lasting effect on natural teeth [4]. When exposed to food and drinks, the teeth that have been bleached are more prone to colour fading or discolouration just after bleaching

With the spread of COVID 19 which is commonly known as Severe Acute Respiratory syndrome SARS COV 2 has created high mortality among the population. COVID 19 was declared as a pandemic by the World health organization impacting a large number of people worldwide. Till today the proper treatment protocol for treating the patients with Coronavirus infection is still evolving. During the pandemic situation, different systems of medicine deliberately worked on finding a cure against COVID 19. In the race directed to discover a therapy for the lethal coronavirus, physicians of Siddha medicine (a traditional medicine system of Tamilnadu) in Tamilnadu who dug deep into the conventional gadget of medications have found “Nilavembu kashayam” [5] and “Kabasura kudineer” [6], two natural concoctions claimed to be powerful in dealing with COVID 19 cases. A short number of studies in Siddha, inclusive of one after the radical Coronavirus started to unfold in Tamil Nadu in early March of 2021, declare Kabasura kudineer is powerful in dealing with the COVID 19 affected persons. Kabasura kudineer is a natural concoction, comprising dry substances of cirukancori root, mulli root, ginger, pippali, clove, kadukkai, ajwainand lots of different herbs [7]. Nilavembu is a natural tonic, crafted from herbs that enables it to reinforce immunity and aid superior health. Nilavembu kashayam powder includes diverse herbs like nilavembu, vetiver, vilamichaiver, koraikizhangu, black peppercorn, ginger and sandal powder [8].

The ministry of AYUSH below the Govt of India has advocated 60ml of Nilavembu kashayam and Kabasura kudineer decoction two times a day during tough instances of pandemic [9]. In the late instances, people are consuming those natural liquids often in spite of having liquids which include espresso and tea. The study aimed at evaluating the effect of Nilavembu kashayam and Kabasura kudineer on the stability of colour on bleached teeth.

MATERIALS AND METHODS

Selection of teeth

Freshly extracted thirty single rooted human central incisor teeth were selected for this study. All the teeth were checked for the presence of spots, cracks, fractures and extreme discolouration. The teeth with the aforementioned characteristics were excluded from the study. From the time of extraction to the initiation of the tests the teeth were stored in 0.5% chloramine [10] to prevent dehydration. Pumice and prophylaxis brush is used on each tooth to clean. Using a low speed contra- angled handpiece the labial surface is cleaned with slight pressure. The cleaned teeth were later stored in distilled water.

Spectro-photometric analysis

Once the specimens were prepared, spectrophotometric analysis of each tooth was done prior to bleaching. To stabilize the tooth specimen in position and to standardize the colour analysis a closed cell foam base was used to ensure that the spectrophotometer was aligned to the long axis and amelo-cemental junction of the tooth. According to the CIE-Lab (Commission Internationale de l’Eclairage L*, a*, b*) the

spectrophotometric values were collected from each specimen from the central portion of the tooth colour space spectrophotometer. Before the measurement of spectrophotometric values, the device was calibrated using a white and green standards present in the rechargeable base. The value of colour variation (ΔE) was measured using (ΔL*) (Δa*) (Δb*) values.

Bleaching of tooth specimen followed by spectrophotometric analysis

After the initial spectrophotometric analysis, the teeth were bleached using POLO IN-OFFICE kit following manufacturer instructions. On the buccal surface of each tooth specimen the bleaching gel was applied and was left for 8 minutes to promote the action of the bleaching agent. The specimens were stored in distilled water after rinsing using water. For three consecutive days the bleaching procedure was repeated. To evaluate the effect of bleaching the spectrophotometric analysis was done for each tooth sample at the end of the third day.

Study Groups

After the bleaching procedure and spectrophotometric analysis the teeth samples were divided into three groups according to the immersion liquid

Group 1 -Immersed in Kabasura kudineer

Group 2 - Immersed in Nilavembu kashayam

Group 3 - Immersed in Distilled Water (control)

Preparation Of Herbal Decoction

According to Tamilnadu health department protocol the Kabasura kudineer and Nilavembu kashayam were prepared by dissolving 5g of the respective herbal powder in 240 ml of water, boiling it well and reducing it to 60ml [9].

The teeth samples were immersed in Kabasura kudineer and Nilavembu kashayam for 8 minutes at 24 hours intervals for 3 days. In between immersion the teeth samples were placed in a wetting agent and stored at 37 degree Celsius to simulate the oral environment. The spectrophotometric values (L*,a*, b*) of all the samples after immersion is recorded. The ΔE value is calculated according to spectrophotometric guidelines.

For each experimental time the differences (final value minus initial) between the CIE-Lab coordinates (ΔL*, Δa* and Δb*) were calculated. With this information, the value of the colour variation (ΔE) result was determined according to the formula: $\Delta E = [(\Delta L^*)2 + (\Delta a^*)2 + (\Delta b^*)2]1/2$ where ΔL*, Δa* and Δb* are the differences in the respective values before and after staining [10].

RESULTS

The Normality tests, Kolmogorov-Smirnov and Shapiro-Wilks test results reveal that the study followed normal distribution (Table 1). Therefore, to analyze the data, a parametric test was applied. One way ANOVA was used to compare the mean values recorded for all the variables included in the study (Table 2). Tukey's post hoc test was used to compare pairwise data among the study group. To analyze the data SPSS (IBM SPSS Statistics for Windows, Version 26.0, Armonk, NY: IBM Corp. Released 2019) was used. Significance level was fixed as 5% ($\alpha = 0.05$). P-value <0.05 is considered to be statistically significant.

Table 1: Descriptive Statistics Of Amount Of Colour Change Among The Study Groups

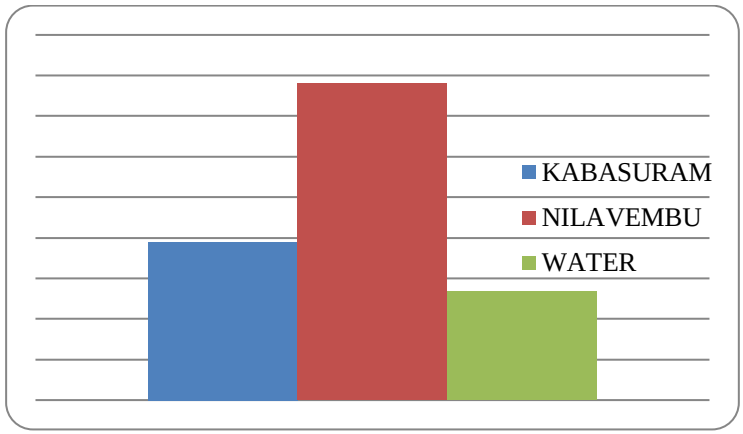
Variables	Kabasura kudineer	Nilavembu kashayam	Water
Mean	3.9000	7.8160	2.6730
Std. Error of Mean	.81962	1.17799	.62440
Std. Deviation	2.59185	3.72514	1.97452
Variance	6.718	13.877	3.899
Range	11.87	8.44	5.86
Minimum	2.47	1.13	.27
Maximum	14.34	9.57	6.13

Table 2: One Way Anova Was Used To Analyze The Mean Difference Among The Study Groups

Variables	Sum Of Squares	Df	Mean Square	F	P-Value
Between Groups	144.303	2	72.152	8.837	.001
Within Groups	220.438	27	8.164		
Total	364.741	29			

Table 3: Post Hoc Tukey Test Was Used To Analyze The Mean Difference Among The Study Groups

(I) Study Group	(J) Study Group	Mean Difference (I-J)	Std. Error	P-Value	95% Confidence Interval	
					Lower Bound	Upper Bound
Kabasura kudineer	Nilavembu kashayam	-3.91600*	1.27784	.013	-7.0843	-.7477
	Water	1.22700	1.27784	.608	-1.9413	4.3953
Nilavembu kashayam	Kabasura kudineer	3.91600*	1.27784	.013	.7477	7.0843
	Water	5.14300*	1.27784	.001	1.9747	8.3113
Water	Kabasura kudineer	-1.22700	1.27784	.608	-4.3953	1.9413
	Nilavembu kashayam	-5.14300*	1.27784	.001	-8.3113	-1.9747



Graph 1 shows the mean difference of amount of bleaching among the study groups.

Post hoc Tukey test was used to analyze the mean difference among the study groups (Table 3). P-value <0.05 was considered to be statistically significant. While assessing the pairwise comparison it was found that, comparison between Kabasura kudineer with Nilavembu kashayam and Nilavembu kashayam with water showed a statistically significant difference whereas pairwise comparison among the water and Kabasura kudineer was found to show statistically insignificant difference among the study groups. The mean was found to be higher in Nilavembu kashayam which is clearly illustrated in the Graph 1, followed by Kabasura kudineer and water.

DISCUSSION

The common symptoms of COVID 19 are cold, cough and fever. According to siddha literature the common medicines used for tackling aforementioned conditions are Kabasura kudineer (KK) and Nilavembu kashayam (NK) [9,11]. During the outbreak of chikungunya and dengue fever, Nilavembu kashayam was considered as one of the essential anti-viral Siddha medicines [12]. As per OECD guidelines utilizing Nilavembu kashayam was considered to be safe as an antiviral drug against chikungunya and dengue fever [13]. The phytochemical screening studies proved that Nilavembu kashayam apart from having antiviral activity also has antipyretic, anti-microbial, anti-inflammatory and immunostimulant activity [14]. During the pandemic situation, different systems of medicine deliberately worked to find a cure against Covid 19. One such cure recommended by AYUSH was Nilavembukasayam and Kabasura kudineer [9].

Tooth bleaching is the commonest and widely used tooth whitening procedures in the field of dentistry. Studies have proved that alterations in enamel pattern [15] after bleaching with carbamide peroxide and hydrogen peroxide increases the permeability of enamel which in turn creates an ideal environment for plaque and stain accumulation in that tooth [16]. The two unique herbal drinks Nilavembu kashayam and Kabasura kudineer often consumed by people in the pandemic period necessitate the need for assessing the staining ability of these concoctions on the bleached teeth.

The two general approaches usually used to assess the normal shade of teeth are visual correlation and instrumental estimation. In dentistry, visual assessment depends on the correlation of the leftover teeth in the patient with commercially accessible shade guides as a shading standard. Colourimetry is used for the

subjective and quantitative estimation of tooth colour. Normal colourimetric guidelines are: CMYK, RGB, HSL and CIE-Lab [17]. For the assessment of the teeth colour, different techniques can be utilized, like the utilization of spectrophotometers, colourimeters and automated picture examination. Due to the irregularity among dental specialists in coordinating with the tooth colour when utilizing these techniques, instrumental methodologies have been examined in lab and clinical stages to attempt to get more solid estimation [18]. A spectrophotometer or spectro-radiometer is normally utilized in estimating tooth tone as an option in contrast to visual evaluation.

Our study is the first kind of study which evaluated the effect of these herbal concoctions on bleached teeth. Previous studies often evaluated the effect of coloured beverages and cola based drinks on bleached teeth. From the results of our in- vitro study, the mean difference of the amount of colour change among the study groups (Graph 1) showed Nilavembu kashayam causes more discolouration on the enamel surface followed by Kabasura kudineer and water. The neutral pH of the natural concoction consumed post bleaching promotes enamel surface roughness for stain accumulation [19,20]. Nilavembu kashayam having neutral pH has more staining ability on the bleached teeth compared to Kabasura kudineer. Further clinical studies are required to confirm the staining ability of herbal concoctions Nilavembu kashayam and Kabasura kudineer on the bleached teeth. Awareness must be created among patients who have undergone bleaching about the discolouration potential of these herbal concoctions.

CONCLUSION

Within the study limitations of the vitro study, the data obtained suggest that Nilavembu kashayam has more potential to cause discolouration in bleached teeth followed by Kabasura kudineer. More clinical studies are required to assess the staining ability of these herbal concoctions on the bleached teeth to formulate preventive measures to tackle the clinical challenge.

Conflict of Interests: Nil

Source of funding: Nil

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