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Effects of Commercially Available Herbal Mouthrinses on the Color Stability of Different Resin-based Composite Restorative Materials

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Authors' contributions

This work was carried out in collaboration between all authors. Author NSS designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors AA and SR managed the analyses of the study. Authors RB, SK and NS managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Colour match is one of the most important physiognomies of aesthetic restorative materials. Functional maintenance of colour throughout the lifetime of restoration is significant for durability of treatment.

Objectives: Aim of this study is to assess the changes of three commercially available herbal mouthrinses to keep a record on color permanency by using four different composite restorative materials.

Methods: specimens (10x2 mm) were prepared in disc shape from each of the following materials: All composites containing nanohybrid particles:

Tetric N-Ceram (Ivoclar Vivadent, India), FiltexZ250 (3M/Espe), Solare X (GC, India Dental), Charisma (Heraeus Kulzer, India).

After preparation of specimen they were kept in distilled water at 37℃ for 24 hours. With the help of colorimeter initial change in color values of each specimen were recorded. After recording the initial

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change in color, 10 specimens from each group were immersing in 1 of the 3 mouth rinses and distilled water was kept as control. The specimens were stored in 20 mL of each mouth rinse (Oramint herbal, Hiora-K, Dentobac herbal) for 12 hours. After immersion, the color values of all specimens were re recorded, and the color change was ΔE*ab was observed and calculated.
Results: All specimens exhibited color changes after immersion, and there was slight difference that was noticed among restorative materials and mouth rinses (P<.05).
Conclusion: According to results of present study, effects of oramint 3mouth rinses caused more color change of the materials used. And among those, FiltexZ250 composite material retained more stain.

Keywords: Mouthrinse; resin composite; color.

1. INTRODUCTION

Restorative materials that are tooth coloured have been extensively used to meet patients' esthetic demands in dental practice. Composite resins having features like different particle size, shape, and different fillers are easily available and are utilized for specific purposes [1]. There are various innovations of composites, but nanotechnology and nanocomposites who have much better response and have reported to be used widely [1,2].

Nanocomposites are at higher demands because it has advantages such as reduced polymerization shrinkage, improved mechanical and optical properties, and also has better gloss retention. [2] compared to microhybrid wear resistance of nanocomposite are superior [3].

There was one more development of new technology based on nanocomposite that was Ceramic-based containing methacrylate modified silicon-dioxide [4].

Composite resin has many advantages but one of major drawback of composite resin is discoloration. There are numerous extrinsic and intrinsic factors which are held responsible for discoloration. Thus in order to avoid this problems there were many modifications done in resin matrix and filler contents [5]. Acc to Lee YK et al. [6] salivary esterases can increase or decrease the internal and external discoloration. Therefore, for longevity of restorations and to avoid discoloration, protocols for the evaluation of the influence of organic substances on the extrinsic staining of restorative materials should be included in the evaluation of aesthetic restorative materials [6].

Color matching plays a vital role in achieving good results. If restored composite starts getting discoloured it is totally unacceptable and may lead to replace the existing restoration [6]. Factors such as coffee, tea, nicotine, beverages, and mouth rinses are majorily responsible to cause stains extrinsically.

There are various degrees of discolouration and among them major three are: Discoloration that is cause due to external sources such as growth of plaque and surface stains (extrinsic stain), superficial or sub-surface color variation supposing superficial degradation and reaction of staining agents within the superficial layer of composite resins (absorption), body, or intrinsic discoloration due to physical–chemical reactions in the deeper portion of the restoration [6].

Thus this antimicrobial mouth rinses limits the growth of dental plaque, and also keeps an eye on progression and regression of caries and periodontal disease [7]. In spite of the increased use of mouth rinses, research comparing resin composite color changes related with use of herbal mouth rinses is limited [6].

In previous studies various authors have mentioned about consequence of alcohol containing, chlorhexidine-gluconate–containing, and hybrid mouth rinses on the color constancy of glass ionomer, compomer, and micro hybrid composite [8]. To the finest of our data however, there has been no study comparing the effect of commercially available herbal mouth rinses on newly developed resin composite materials [9-12].

Commission International de l'Eclairage (CIE L*, a*, b*) system was selected for the current study to assess discolouration. It is also likely to calculate the total color change (ΔE*ab), which reflects the changes of L*, a* and b* [1].

Human eye can detect verges of colour changes therefore colour differences were evaluated in various studies by this method directly.

The aim of this study is to evaluate effects of commercially available herbal mouth rinses on color stability of four different resin-based restorative material.

2. MATERIALS AND METHODS

The restorative materials used in the present study encompassed All Nano hybrids compositeTetric N-Ceram (Ivoclar Vivadent, India), FiltexZ250 (3M/Espe, St. Paul, MN, USA), Solare X (GC, India Dental), Charisma (Heraeus Kulzer, India). Forty disc shaped samples from each restorative material, were prepared having thickness of 2 mm and diameter of 10 mm, in a stainless steel mould covered with a celluloid matrix and glass slides. Composite resins were polymerized with an LED unit in for 20 seconds for two cycles with a light intensity of 400 mW/cm2 from the upper and lower surfaces of the specimens. The distance between the light and the specimen was standardized by using a 1-mm glass slide.

The specimens were incubated in distilled water at 37℃ for 24 hours. Then, the baseline color values of each specimen were measured with a colorimeter Quality of color was examined using the Commission Internationale de l'Eclairage (ΔL*, Δa*, and Δb*) compared with standard condition.. Measurements were repeated 3 times in each sample and mean values were calculated.

Treatment groups were commercially available herbal mouth rinses (Oramint herbal, Hiora-K, Dentobac herbal) and distilled water as a control. Forty specimens of each restorative material group were randomly divided into 4 subgroups (n=10), and each subgroup was stored in 20 mL of one of the mouth rinses for 12 hours, which was reported as the equivalent of 2 mouth rinses per day for 1 year. Specimens were kept at 37℃ throughout the study, and test solutions were shaken every 3 hours to provide consistency. At the end of the test period, the specimens were removed and submerged in distilled water. After the immersion, the color values of each specimen were remeasured, and the color change value ΔE*ab was calculated:

According to the following formula: ΔE*ab =[(ΔL*)2 + (Δa*)2 + (Δb*)2]1/2 where L* stands for lightness, a* for green-red (-a=green; +a=red) and b* for blue-yellow (-b=blue; +b=yellow).

Statistical analyses were performed using a 2-way analysis of variance and Tukey's HSD (Honestly Significant Differences) test at a significance level of 0.05.

3. RESULTS AND DISCUSSION

The present study assesses the changes of three commercially available herbal mouthrinses to keep a record on color permanency by using four different composite restoratives [13,14]. According to the results, the use of herbal mouth rinses does not cause that much stain as compared to normal regular mouthwash but slight colour change was noticeable.

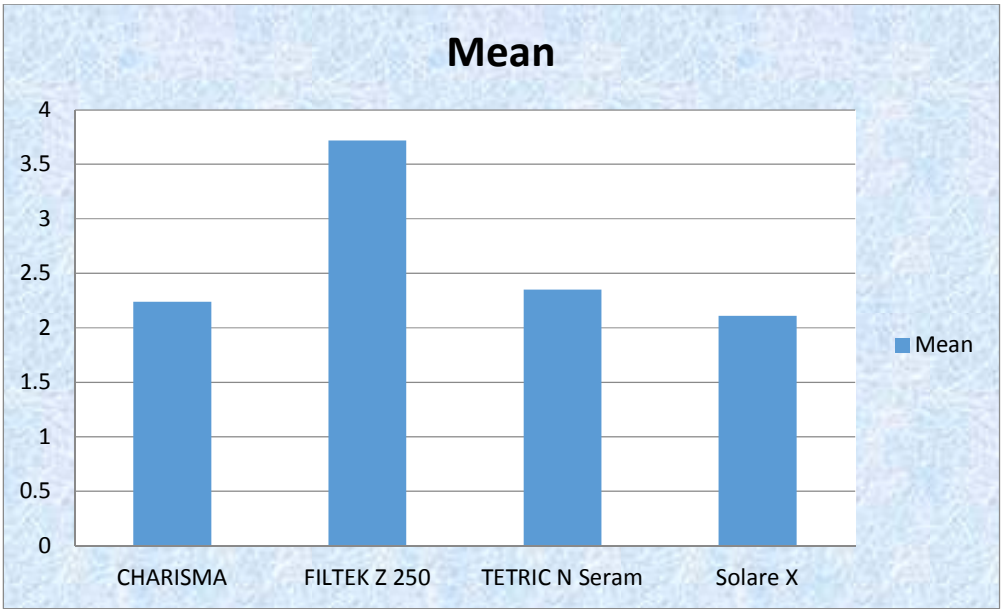
Villata et al. [4] have proven that surface integrity of composite resins get affected by low pH and alcohol concentration of solutions. However in this study slight colour change was recorded statistically [1].

The amount of stain that is caused by solutions and color changes of composite may be totally depending on material, and matrix or filler content of composite may the major reason for it [15-19] As the initial shade selected for all composite resins were A2, then after that the staining was more with filtex group in which shade turned out to be A3 [8].

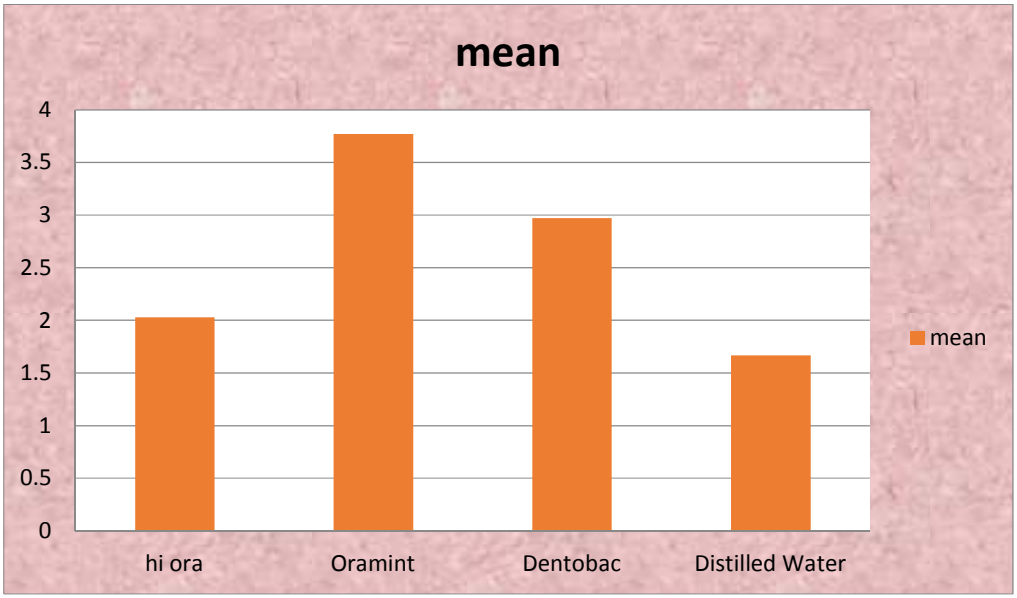
Scotti et al. showed that type of material had role on stain resistance. According to results of current study there was statistically difference between FiltexZ250 and other resin composites [1].

Table 1. It shows mean value for four solutions in all four composites

Solution	n	Minimum	Maximum	Mean	Std deviation
Hiora	40	1.0600	3.4800	2.029250	0.6486293
Oramint	40	1.4600	8.0000	3.770750	1.5394644
Dentobac	40	1.2100	7.0100	2.970500	1.5532925
Distilled water	40	0.3800	3.0000	1.667000	0.5749123



Graph 1. Mean value for 4 composite in all solution



Graph 2. Mean value for all solutions for all composite

Acc to Poggio et al. there is direct impact on susceptibility to extrinsic staining cause of structure of resin and the characteristics of its particles. Moreover, composite resins undergo superficial and microstructural changes subsequently because of mastication, finishing and polishing procedures.

The external and the surface types of discolorations are also closely related to hygiene, dietary, and smoking habits. Every component of composite resins may be involved in sub-surface or intrinsic discolorations [19-22]. The conversion rate and its chemical characteristics, water sorption rate being particularly important because it decides it affinity to cause stains on resin.

According to Tandon et al. oramint contains turmeric and this is major reason for staining and

in this study oramint showed more stains on composites.oramint played major role in staining because of its ayurvedic turmeric content.

Table 2.

Restorative material	Mouthrinses	∆E*ab
1.Charisma	Distilled water	1.20
	Hiora-k	1.29
	Oramint	1.93
	Dentobac	1.41
2.FiltexZ250	Distilled water	1.27
	Hiora-k	1.62
	Oramint	1.23
	Dentobac	2.23
3.TetricN Ceram	Distilled water	1.30
	Hiora-k	1.48
	Oramint	1.62
	Dentobac	1.66
4.Solare-X	Distilled water	1.28
	Hiora-k	1.27
	Oramint	1.67
	Dentobac	1.35

In previous study, Poggio et al. demonstrated that Filtex Z250 did not yeild better surface quality than did the other composites. Acc to Poggio et al. the difference was explained with low filler content of material and porosities that were detected on filtexZ250 specimens [1,2].

Staining potential of various mouthrinses were evaluated for many kinds of restorative materials [5].

Gurdal et al. have proven that there is no difference on color change of composite resin even by immersing it in distilled water. Similarly, Lee et al have found that although visually no perceptible, mouthrinses affect color stability.

Thus in current study herbal mouthrinse oramint showed difference compared to other mouthrinses.

4. CONCLUSION

According to results of present study, effects of oramint mouth rinses caused more color change of the materials used. And among those, FiltexZ250 composite material retained more stain.

However, conducting In Vivo studies in future should be considered to get more appropriate details.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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