



To Analyze The Influence of various beverages on surface microhardness of single shade universal composite resin -An in-vitro study

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Volume 6, Issue 15, Nov 2024

Received: 15 Oct 2024

Accepted: 05 Nov 2024

Published: 25 Nov 2024

[doi:10.48047/AFJBS.6.15.2024.15280-15288](https://doi.org/10.48047/AFJBS.6.15.2024.15280-15288)

Introduction –

The average particle size of nano hybrid composite material is less than that of the micro-filled composite resin materials. Nano hybrid composite material is becoming popular because of its physical, mechanical and esthetic properties. Resin-based composite (RBC) materials are increasingly being used for the restoration of posterior teeth¹. The mechanical and physical properties of composite resin restorations, including durability, hardness, resistance to abrasion, surface smoothness, prevention of secondary caries, susceptibility to microleakage, plaque accumulation, the overall appearance of the restoration, and patient satisfaction, all contribute to their ultimate success.

Now-a-days consumption of acidic food, fruit juices, soft drinks, coffee, tea or wine can result in decreased hardness and surface damage and also the esthetic quality of the restorative material. Beverages have a different erosive potential dependent on the pH and titration acidity²

The effect of these beverages on the quality of the restoration depends on the chemical composition of the restorative material. The wear and discoloration of restorative materials are known to be influenced by the size, concentration, and resin formulation of the filler particles.

One particular challenge in restorative dentistry is shade selection, as it can be difficult and is influenced by the operator's skill and environmental conditions. “Blending effect” (BE) or “chameleon effect” describes the ability of a material to acquire a colour similar to that of its surrounding tooth structure³

To address such type of issue and make shade selection more convenient, universal composites have been developed. These composites, specialized products like CHARISMA Topaz single syringe dental can be used in direct restoration of class 1 to

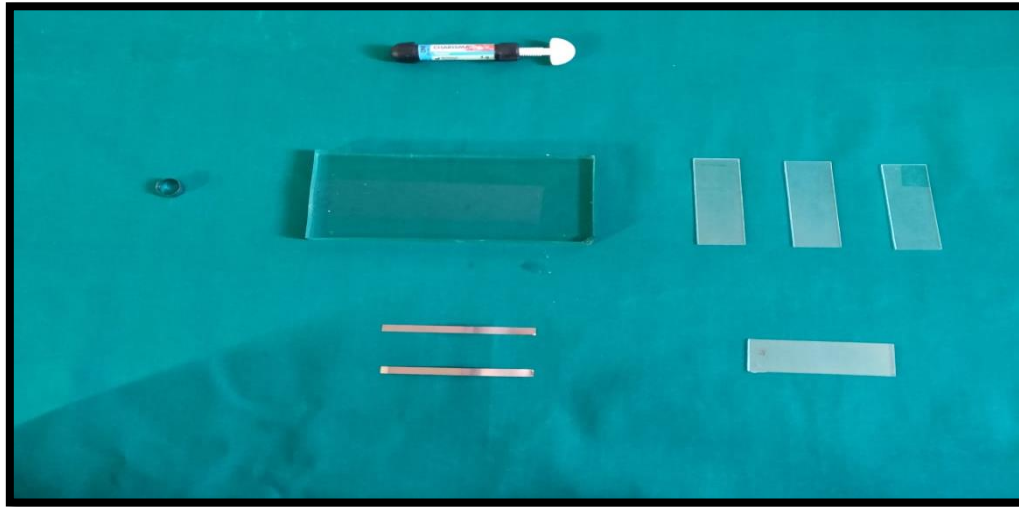


class 5 cavities.

This study evaluates a single-shade universal composite material claiming to match various tooth colors.

Understanding how this material interacts with different beverages can help assess its performance and validate its claims. Such research contributes to the advancement of dental materials and encourages the development of more durable and aesthetically pleasing options for dental restorations.

Aim – This study has been conducted to analyze the interaction of the above-mentioned composite resin with various beverages and determine the resultant surface characteristics. The aim of this investigation was to determine how various beverages affect the microhardness of a single-shade universal resin composite material.



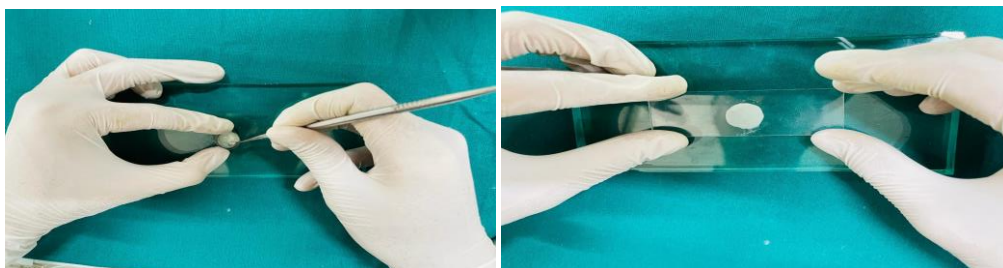
charisma single shade universal composite, stainless steel mold, glass slides and mylar strips

Objective -

- This study is aimed to evaluate the fracture resistance using a single shade universal composite resin material with the help of four different beverages.
- The effect of both these beverages on the surface of composite resin mainly depends on the exposure time and chemical composition of these materials⁴

Materials and Methods -

- 40 composite disc shaped samples will be prepared, 10 for each group, samples will be placed into mold and will be sandwiched between mylar strips and two glass slides.



- Samples will be light cured for 20 seconds and then polished with super snap polishing kit.

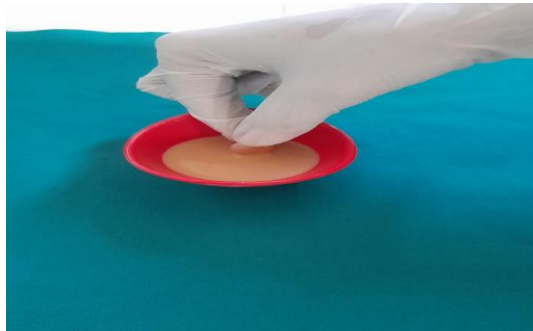


- Then sample will be stored in distilled water for 24 hours to complete polymerization and rehydration.

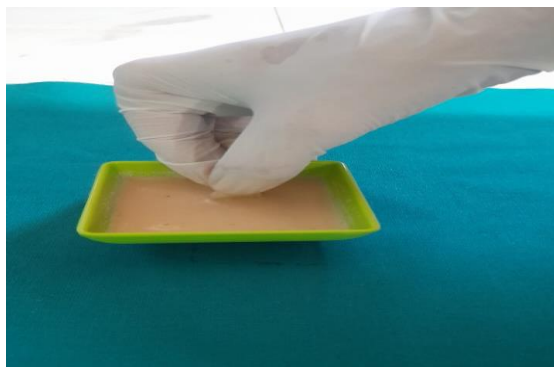


- Totally 4 experimental groups will be formed based on type of beverage

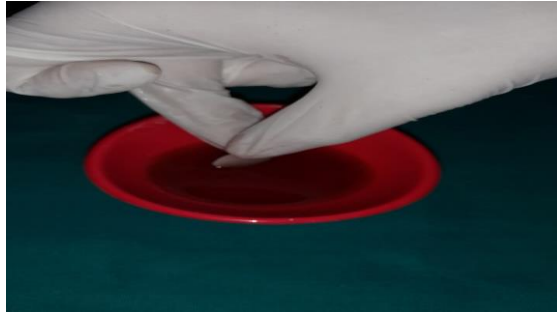
1) Beverage that includes tea(n=10)



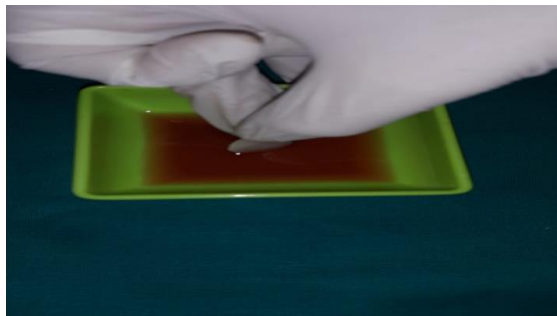
2) Beverage that includes coffee(n=10)



3) Beverage that includes coca cola (n=10)



4) Beverage that include red wine(n=10)

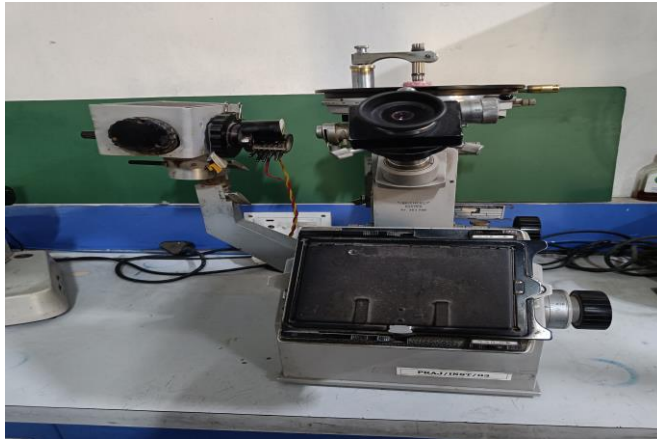


- Sample immersion protocol will be followed for 15 days daily for 15 minutes.



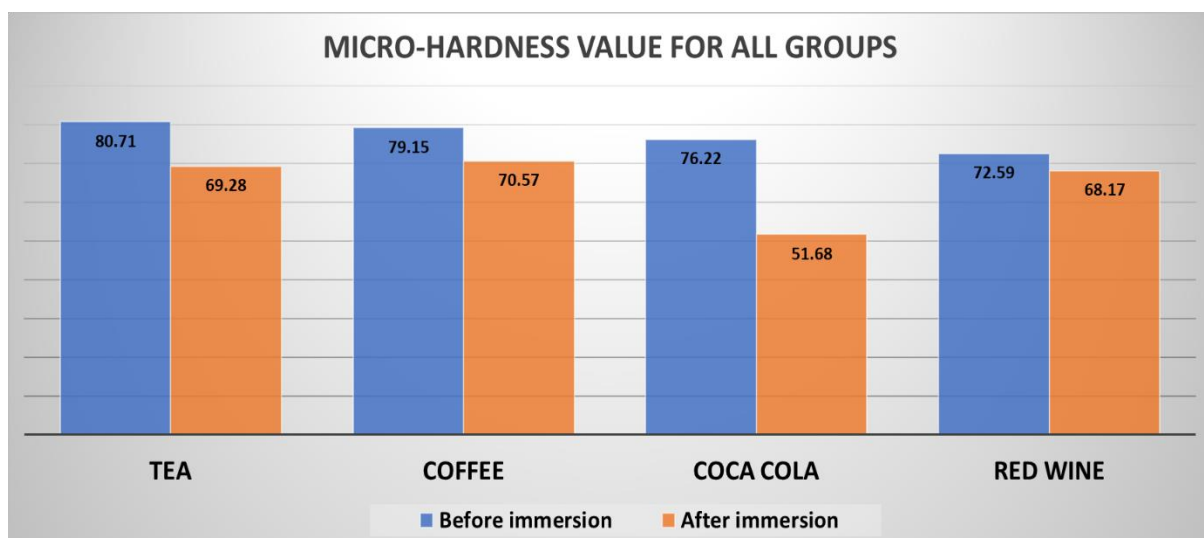
- To obtain a baseline value each group was subjected to surface microhardness measurement. The hardness value in kg/sq mm of each specimen was determined using a microhardness tester with a diamond Vickers indenter.
- To compact the material and to prevent void formation, a microscopic slide was placed over the composite material⁵
- After each polishing step, specimens were thoroughly rinsed with water for 10 seconds to remove debris⁶

- The surface hardness test was carried out at following intervals before immersion and after intervals of 15 days.

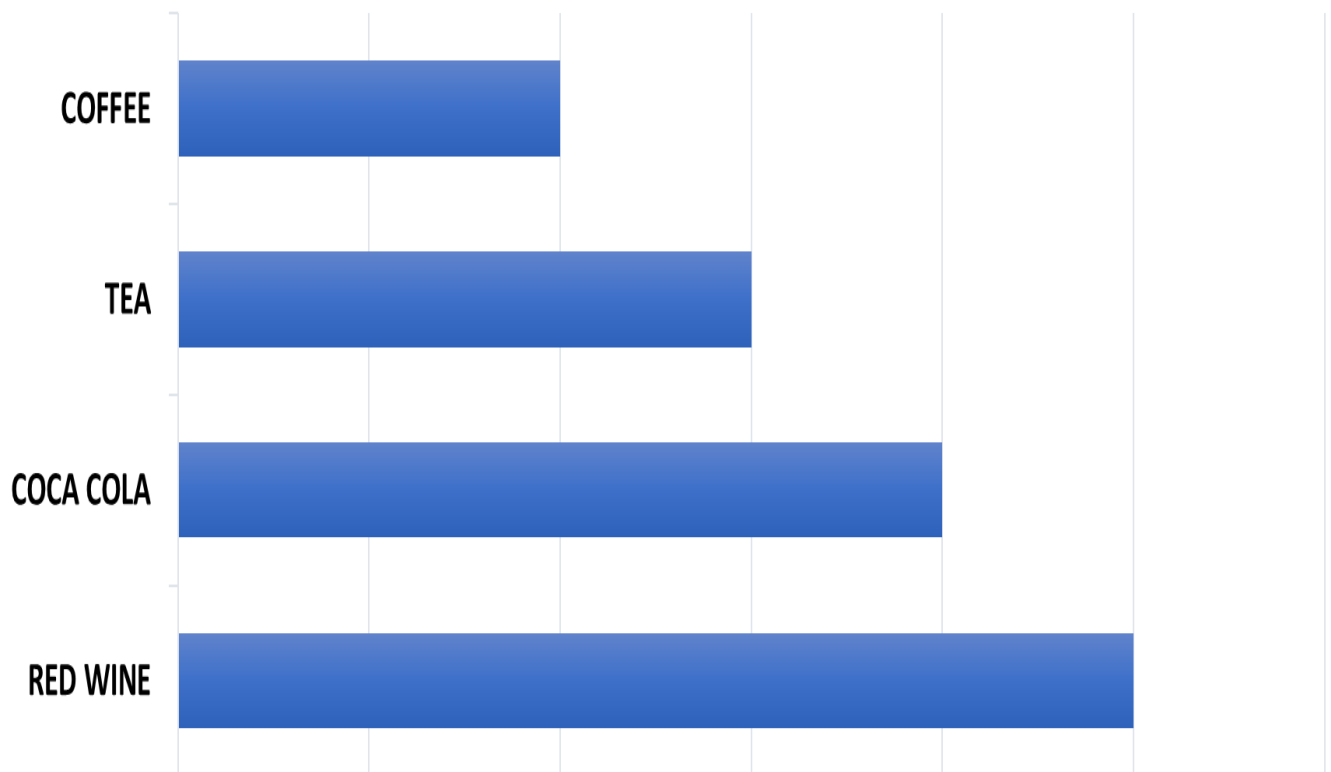


- Gradual changes in surface microhardness were recorded at each time interval. ONE Way ANOVA and multiple comparison post hoc Bonferroni holm test. Mean micro hardness and standard deviation of materials tested were recorded by immersing in different beverages for duration of 15 minutes.

Results –



DISCOLOURATION VALUES FOR ALL GROUPS



DISCUSSION

- All groups showed decreased microhardness values from the initial week of immersion until the end of the 15 days period.
- All groups showed decreased microhardness values from the initial week of immersion until the end of the 15 days period.
- Aerated drink has the lowest titratable acidity, and it is a carbonated beverage containing carbonic acid and phosphoric acid which promotes dissolution and it easily erodes the materials.
- Since the pH of tea is nearly 7, the water in the tea can degrade polymer materials.
- The polymer materials absorb water, and there is a loss of chemical bond between filler particles and the resin matrix.
- Decreased in microhardness with coffee is mainly due to dislodgement of filler particles.
- Alcohol in beverages softens polymer matrices and dislodges filler particles. This results in a rapid decrement in microhardness. The staining resistance of resin-based

restorations in the oral environment is a crucial requirement for withstanding the exposure to saliva, food, and drinks, which are common extrinsic factors that lead to the discoloration of dental restorations⁷

- Coffee is commonly used as an artificial staining solution and are more resistant to be removed compared with tea⁸
- There is still need of in-vivo study to determine the effect of beverages.

CONCLUSION -

Within the limitations of the study, all the beverages used significantly reduced the microhardness, immersion in aerated drink caused more surface hardness reduction over time than other beverages. The effect of these beverages depends on the exposure time and chemical composition of the restorative material and beverages. Filler loading, filler content and pH of beverages also plays a crucial role in hardness of the materials. It can be concluded that coffee aging is influenced more by the materials composition⁹. Shade matching is composite material and shade dependent but, in this case, it is mainly due to filler content of omnichroma resin¹⁰

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