



## INFLUENCE OF DIFFERENT SPORTS/ENERGY DRINKS AND ALCOHOLIC BEVERAGES ON THE SURFACE ROUGHNESS AND MICRO HARDNESS OF THREE DIFFERENT ESTHETIC MATERIALS: AN IN VITRO ANALYSIS

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### ABSTRACT

**Aim:-** Effect of sports /energy drinks alcoholic beverages on surface roughness and microhardness of dental composites

**Materials and Methods:-** The study will be conducted on 189 sample of dimension 0.5 cm circumference and 0.4 cm height with three different composites Ivoclar Tetric N Ceram, Filtek Z 350 XT, GC Solare Sculpt; 63 samples with each esthetic material will be made. The prepared samples will be tested in six experimental sports/energy drinks (Gatorade, Red Bull, and Sting) and alcoholic beverages (beer, whiskey, vodka) and distilled water was considered as the control group. Analysis of all samples will be recorded after the immersion of the specimen in the experimental and control solutions for 15 min/ day for 30 days. Analysis of the composite will be done by surface roughness and micro hardness before and after immersion in the experimental

liquids and controlled group. Comparative evaluation of the surface roughness and microhardness of the samples will be evaluated and it will be seen that which of the composite is having better properties

**Keywords:-** Filtek Z 350 XT, GC Solare Sculpt, Ivoclar Tetric N Ceram, Microhardness, Surface Roughness.

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## INTRODUCTION

Dental composites are compounds by an organic polymerizable matrix, inorganic fillers, borosilicate, silica, and a silane-coupling agent.<sup>1</sup> The use of resin-based dental restorative materials has increased because of their good aesthetic, easy handling, and ability to establish a bond to dental hard tissue. The surface degradation of resinous materials is dependent on the composition of the resin matrix, content, distribution of the fillers, and the effect of silane surface treatment on the fillers.<sup>2</sup> Roughness is mainly influenced by the composite resin filler. The larger the size and load of filler particle in a resin product, the rougher the surface.<sup>3</sup> Surface roughness can cause problems such as an increased retention of plaque and microorganisms, which can further develop into secondary caries and restoration failure. Surface roughness can also cause food particles to easily adhere to the restoration, causing increased discoloration<sup>4</sup>

Hardness that might be defined as the resistance of a material to indentation is an important mechanical property that predicts the degree of cure of restorative materials.<sup>5</sup>

## MATERIALS AND METHODOLOGY



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A total of 189 samples were made of identical cylindrical 0.5cm circumference and 0.4cm height in the in-vitro study in Desh Bhagat Dental College and Hospital, Mandi Gobindgarh. The data was divided properly into the groups and subgroups. In each group, 63 samples of each composite (Ivolar Tetric-N-Ceram A2 shade, Filtek Z350 XT A2 shade, Solare Sculpt A2 shade) were made. It was further divided into 9 samples per subgroup which includes 3 sport drinks (Gatorade, Red Bull, Sting) and 3 alcoholic beverages (Beer, Whiskey, Vodka) and 9 samples in the distilled water as controlled group.

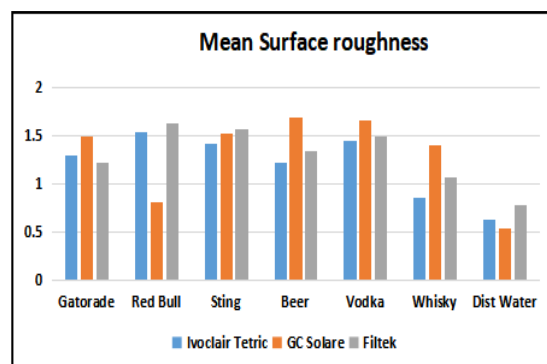


54 samples from each type of experimental composite material was subjected to immerse in different sports drinks and alcoholic beverages for time period of 15 minutes at room temperature daily over a 30 day test period. The 9 samples of each composite materials were immersed in distilled water (control group) as per the same protocol for immersion time and test period. When the sample was not immersed in the experimental solution it was immersed in Artificial Saliva at room temperature in incubator .

Surface roughness and microhardness was evaluated by surface roughness tester and microhardness testing machine respectively

## RESULTS

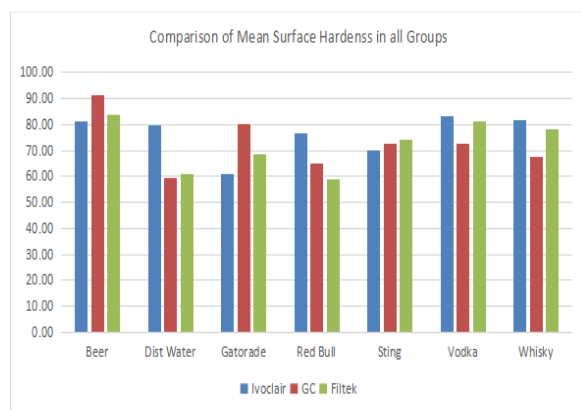
Graph shows In Ivoclar (0.85) and Filtek (1.07) group whisky has least surface roughness compared to distilled water but in GC solare sculpt (0.80) group Red bull has least surface roughness. Although maximum surface roughness produces by Redbull in Ivoclair (1.53) and Filtek (1.69) group but in Gc solare group Beer (1.63) produces maximum surface roughness.



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Of all the test restorative materials used in this study, Ivoclar Tetric N Ceram showed the minimum surface roughness while Filtek Z350 XT showed the maximum surface roughness.

Graph shows Ivoclar composite in gatorade shows minimum micro hardenss



(60.74) and Gc solare Sculpt and Filtek Z350 XT composite shows minimum hardness in Red bull (58.91 and 64.84) Solution. Although maximum Microhardenss is noticed when Ivoclar Tetric N ceram composite in Vodka (83) and Gc Solare Sculpt and Filtek Z350 XT

both have maximum hardness in Beer (83.82 and 91.32) solution.

Also it can be said that filtek Z350 xt had maximum microhardness, Tetric N ceram had minimum microhardness.

## DISCUSSION

Restorative dentistry materials mainly run on two principles which is functional results and aesthetic outcomes. The ideal environment to test the behavior of these restorative materials properties in the mouth; hence they are required to have long-term durability.<sup>6</sup>

In today's world under the influence of Mass Media, there is a marked increase in consumption of alcoholic beverages and Sports/Energy Drinks, especially in young population all over the world. Consumption of beverages negatively alters the mechanical properties of all composite resin material.<sup>7</sup>

Of all the mechanical properties of a composite resin material, especially surface roughness may be greatly affected by the general chemical

composition of the beverages, the acidic concentration of the beverage and also the potency of the individual acidic ingredient.<sup>7</sup>

The surface roughness (Ra) refers to fine irregularities in the surface texture that usually result from the action of the production process or material manipulation conditions and is measured in micrometers ( $\mu\text{m}$ ). This parameter describes the overall roughness of the surface and can be defined as the arithmetic average value of all absolute distances of the roughness profile from the center line within the measuring length.<sup>8</sup>

The microhardness tests are used to check the degree or conversion of monomers into polymers after polymerization of composite resins. The mechanical tests were chosen because they reproduce the deformation experienced by the composite resin when the oral cavity in the act of chewing.<sup>9</sup>

Composite resin posterior restorations are influenced by mechanical properties, such as fracture toughness, compressive strength, flexural strength, wear resistance and diametral tensile strength. The variation in strength between different composites may be explained by the differences in the chemical composition of the matrix, fillers, and filler size and distribution. Thus, a reduction in size and increase in volume of fillers are directly proportional to an increase in compressive strength and surface hardness. Composite restorations tend to wear faster than amalgam restorations. Filler content in composites has a direct effect on rate of wear of composite.<sup>10</sup>

It has been established that the erosive potential of an acidic solution is related to its pH, titratable acidity and buffer capacity. In addition, these drink in their composition have a strong inorganic acid called citric acid. Thus, the association of a low pH and the presence of a strong inorganic acid could have caused a more aggressive attack on the surface of restorative materials hence leading to an effect in surface roughness and microhardness.<sup>11</sup>

The Filtek Z350 XT resin composite was the most prone to surface roughness Ra change with the Red Bull solution. The increase of the surface roughness Ra of the composite materials were related to the resin filler type, type of resin matrix, and type of acidic energy drinks and staining agent.<sup>12</sup> Nano-hybrid Tetric N-Ceram composites, however, have comparable compressive strength to Filtek Z250 and Z350 XT. It has been also evident that the nano-hybrid Tetric N-Ceram has higher compressive and flexure properties than the micro-hybrid Tetric N-Ceram Bulk Fill. It could be attributed to the higher filler loading and nano-filler dimensions in Tetric N-Ceram. As the study conducted by Abuelenain DA et al. the average Ra values as measured from different readings for each composite followed this order: Filtek Z350 XT>Tetric-N-Ceram.<sup>13</sup>

Solare sculpt has unique, homogeneous, prepolymerized nanofillers with high density and uniform dispersion silane treatment technology and contains 300-nm strontium homogeneously dispersed glass fillers with a filler weight of 79%.<sup>14</sup> due to its homogenous nature and 79% filler weight it is having microhardness more than Tetric N Ceram and less than filtek Z350 XT.<sup>14</sup>

According to study done by Sharma A, Nagar P 2018 showed that when Bulk curing is done in case of Tetric N Ceram and Filtek Z 350 ,Tetric N Ceram® showed least hardness value in bulk curing.<sup>15</sup>

In another study done by Deepak BS The other factor that affects microhardness could be the presence of different filler particle size. This can affect degree of composite polymerization as the light beam is scattered and reflected within the composite material, leading to lower microhardness values. Larger filler size variation in G aenial Universal Flo (16-200nm) and Tetric N Ceram (40-160nm) might explain lesser microhardness value when compared to Filtek Z350XT (4-20nm).<sup>14</sup>

## **CONCLUSION**

Within the limitation of the study following conclusion can be drawn

1. Of all the test restorative materials used in this study, Ivoclar Tetric N Ceram showed the minimum surface roughness while Filtek Z350 XT showed the maximum surface roughness.
2. Of all the test restorative materials used in this study, Ivoclar Tetric N Ceram showed the minimum microhardness while Filtek Z350 XT showed the maximum microhardness.

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