Effect of Discolored Drinks Available in the Saudi Market on Composite Restorations

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I.   Introduction

Composite resins are among the tooth-colored restorative materials of choice for many dentists due to their high acceptance by patients and their excellent esthetic properties (Ibrahim et al., 2009[1]; Mazaheri et al., 2013)[2]. Aesthetic restoration material as Nano filled composite resin is being used widely in anterior as well as posterior teeth. (RajkumarK,et al,2011)[3].

Color change of dental resin composite were due to intrinsic and extrinsic factors. (Bencourt S, et al, 2009)4 such as Roughness of the surface (Bagheni R, et al,2005)[5] duration of the contact time with coloring agents(Reis AF, et al,2003)[6],coloring agent(omataY,et al,2006)[7] and type of composite restoration(Aba-Bakr,et al,2000)[8] these findings are most important factor affecting the color stability and long term success of composite resin restoration.(Ren YF,et al,2012)[9].Though, the quality of composite resin restoration has been significantly improved over last decades through innovation of Nano fillers to produce adequate strength and excellent wear resistance with retaining translucency, development of stable polymerization promoters to enhance color stability which consider as one of most important factors when selecting composite resin materials for aesthetic restoration(Ren YF,el al,2012)[9].

Aim of the Research:

To evaluate staining effect of Arabic coffee, A.K tea, S.B coffee on the color stability on resin based composite restorations.

II.   Material And Methods

Study design:

An In vitro study.

Sample Selection& Preparation:

A sample of 40 extracted natural teeth (caries and stain free) will be collected, (cleaning and polishing with a prophylaxis paste using a polishing brush).Then we will prepare Class V Cavity preparation, afterwards it will be restored by resin based composite restorations (Shade A2).

Staining Procedure:

All samples was numbered from 1- 40, then the color shade was assessed before and after staining, according the CIELAB-system with a colorimeter (VITA Easyshade®Compact) Devise in private clinic The sample were distributed equally into four groups according to the selected immersion solution (10 teeth in each Group), then we immersed these teeth in the selected solution and measure the shades in four readings (Before immersion, Directly 1 min after immersion, after 72 hours, after one week).

Color Measurement:

(Easyshade) to test the discoloration and all results will be collected and subjected to statistical analysis.

Statistical Analysis:

The information and data from the study were entered into an electronic database (SPSS® for windows®V.21.0) for windows. Friedman test was used to detect statistically significant difference in the color change at different intervals. Statistical significance is set at $p < 0.05$.

The Result:

The average (median) values of color change of the specimens after immersion in different types of discolored drinks for the resin based composite material used in the study are summarized in Table 1. The

highest color change values than the baseline was observed immediately after immersion in Turkish coffee. Color changes after immersion in black coffee, tea, and Arabic coffee were the same. After three days and seven days, immersion in Turkish coffee showed the highest color change followed by black coffee, tea, and Arabic coffee respectively.

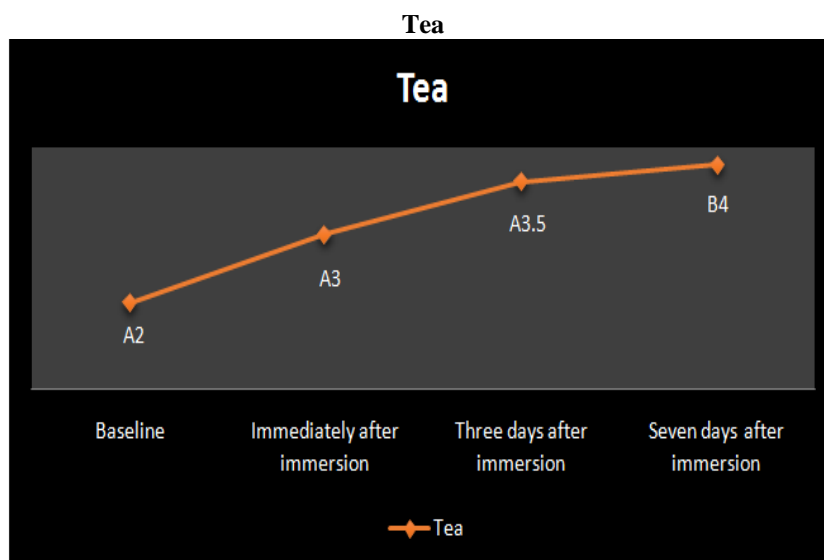|	Baseline	Immediately after immersion	Three days after immersion	Seven days after immersion	p value
Black coffee	A2	A3	C3	A4	0.000*
Tea	A2	A3	A3.5	B4	0.001*
Arabic coffee	A2	A3	B3	A3.5	0.004*
Turkish coffee	A2	A3.5	A4	C4	0.000*

* indicates statistical significance

Table 1. Average color change of the resin based composite materials after immersion in the different discolored drinks
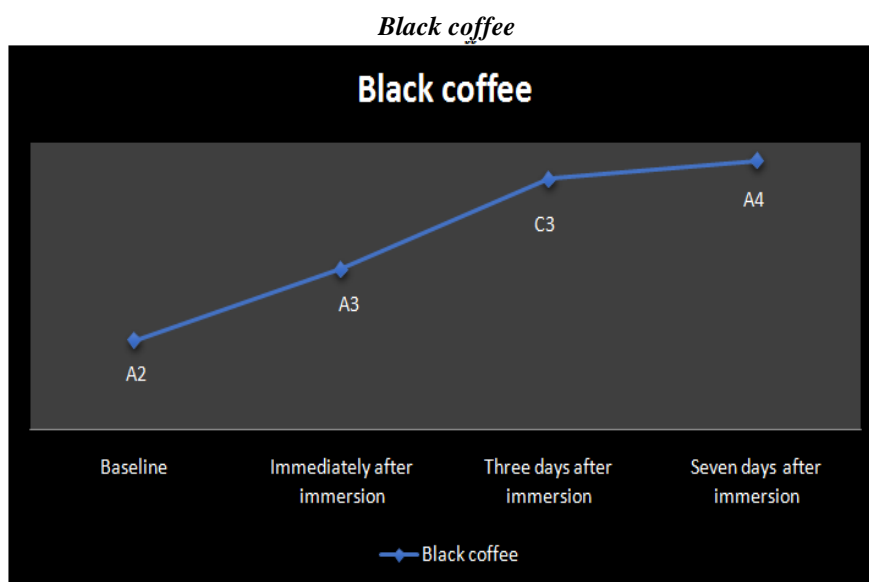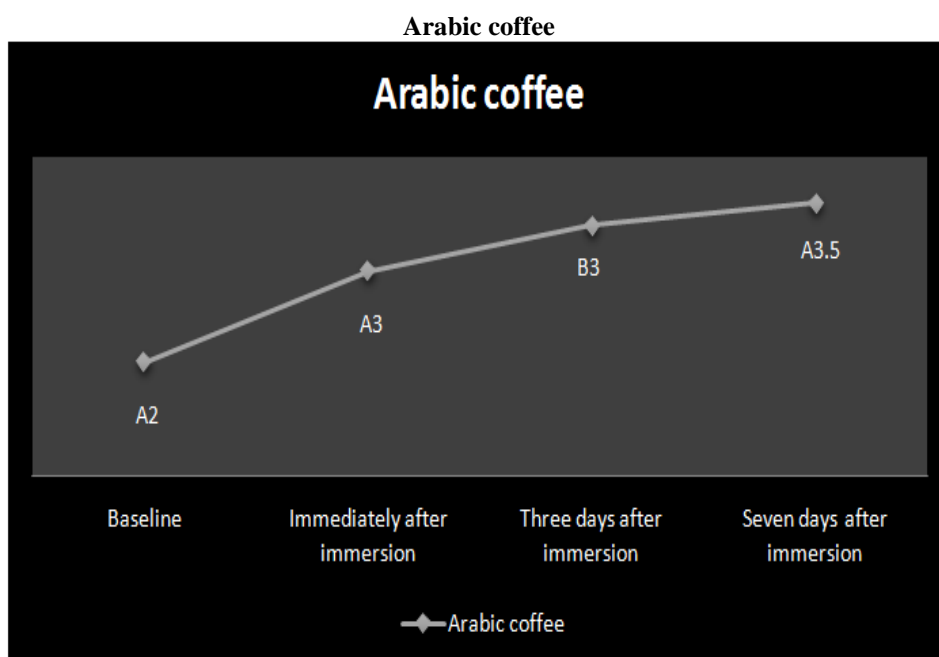
Black coffee

Figure 1. Average color change of the resin based composite materials after immersion in black coffee

Immersion in black coffee showed difference in color change values than the baseline immediately after immersion and at 3 days and 7 days after immersion. Friedman test showed a statistically significant difference in the color change ($p<0.05$). Wilcoxon Signed Ranks test with the Bonferroni correction for each pair of the group showed a statistically significant difference in the color for all pairs ($p<0.008$) (Figure 1).

Tea

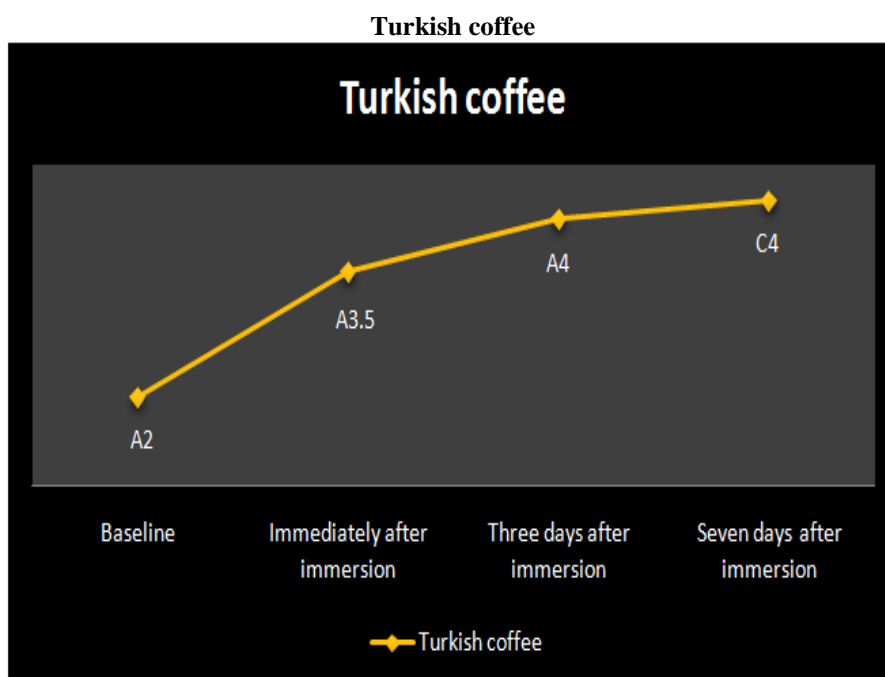

Figure 2. Average color change of the resin based composite materials after immersion in tea

Difference in color change values was observed immediately after immersion and at 3 days and 7 days after immersion in tea from the baseline. Friedman test showed a statistically significant difference in the color change ($p < 0.05$). However, Wilcoxon Signed Ranks test with the Bonferroni correction for each pair of the group showed a statistically significant difference in the color only between baseline and immediately after immersion ($p < 0.05$), baseline and 7 days after immersion ($p < 0.008$), and immediately after immersion and 7 days ($p < 0.008$) (Figure 2).

Arabic coffee

Figure 3. Average Color Change Of The Resin Based Composite Materials After Immersion In Arabic Coffee

Immersion in Arabic coffee showed difference in color change values immediately after immersion and at 3 days and 7 days after immersion from baseline. Friedman test showed a statistically significant difference in the color change ($p < 0.05$). However, Wilcoxon Signed Ranks test with the Bonferroni correction for each pair of the group showed a statistically significant difference in the color only between baseline and immediately after immersion ($p < 0.008$); and baseline and 3 days after immersion ($p < 0.008$) (Figure 3).

Turkish coffee

Figure 4. Average color change of the resin based composite materials after immersion in Turkish coffee

Figure 4 shows difference in color change values than the baseline immediately after immersion and at 3 days and 7 days after immersion. Friedman test showed a statistically significant difference in the color change (p<0.05). Wilcoxon Signed Ranks test with the Bonferroni correction for each pair of the group showed a statistically significant difference in the color among all the pairs (p<0.008) except between immediately after immersion and 3 days after immersion (p>0.008).

Figure 5 indicates that the storage of specimens in different types of discolored drinks and at different time periods causes a clinically diagnosable color change in comparison to the baseline.

Immediately after immersion
Immersion in Turkish coffee showed the highest color change values at "immediately after immersion". There was no difference in the color changes between black coffee, tea, and Arabic coffee. Wilcoxon Signed Ranks test showed statistically significant difference only between Turkish coffee and Arabic coffee (p<0.05), Turkish coffee and tea (p<0.05), and Turkish coffee and black coffee (p<0.05).

Three days immersion
Immersion in Turkish coffee showed greater staining values at "three days" of immersion followed by black coffee, tea, and Arabic coffee. Wilcoxon Signed Ranks test showed statistically significant difference only between Turkish coffee and Arabic coffee (p<0.05), Turkish coffee and tea (p<0.05), black coffee and Arabic coffee (p<0.05), and black coffee and tea (p<0.05).

Seven days immersion
Similar to "three days" of immersion, immersion in Turkish coffee showed greater staining values at "seven days" of immersion followed by black coffee, tea, and Arabic coffee. Wilcoxon Signed Ranks test showed statistically significant difference between all the four different discolored drinks (p<0.05).
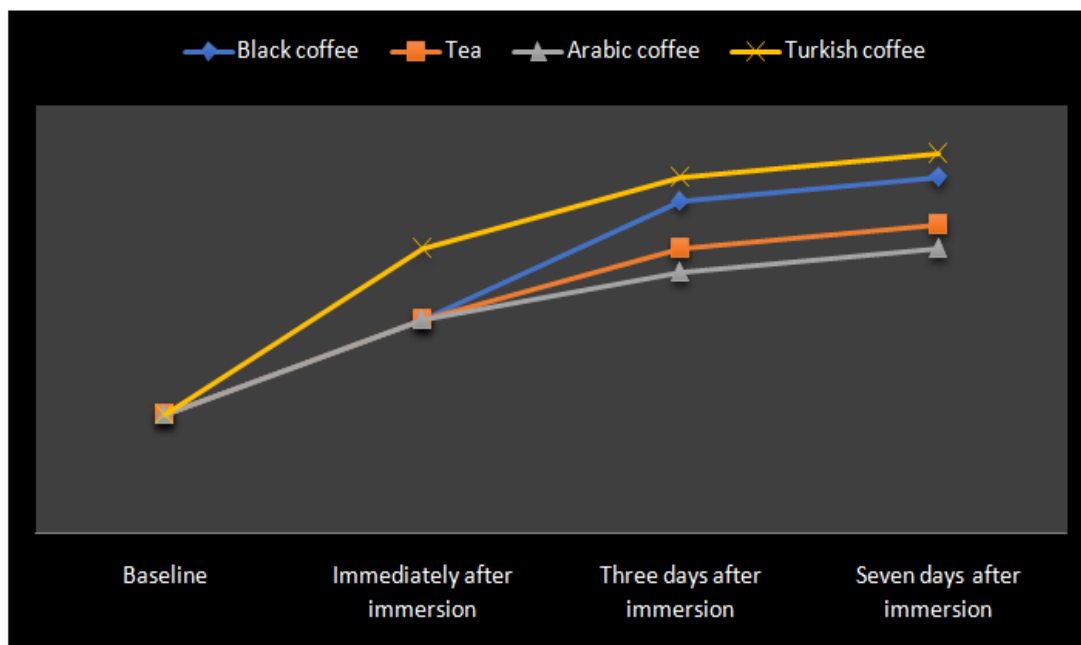

Figure 5. Illustrates comparison between color changes in each group for different time durations

Note
SPSS does not carry out post hoc tests for the Friedman test. If significant evidence is found of a difference, carry out Wilcoxon Signed Ranks tests on each pair of groups but use the Bonferroni correction (significance level/ no. of pairwise tests) to compare the p-value. For example, if using a 5% level of significance for SIX tests, compare the p-value for each Wilcoxon Signed Ranks test with 0.05/6 = 0.008. Hence, a p value of ≤0.008 is considered as statistically significant.

III.   Discussion
Color plays an important role in obtaining optimum esthetic (Nasim ,et al 2010)[10]. However , a major disadvantage of resin composite is their tendency to discolor, which may be a major factor in the replacement of restorations.(Al-NegrishAR,et al 2002)[11].

Resin composite material that can absorb water are also capable of absorbing other other fluids with pigments, resulting in discoloration. It is assumed that water acts as a conductor for the pigment and stain penetration in the resin matrix (Bagheri R et al,2005)[5]Color plays an important role in obtaining optimum esthetic (Nasim ,et al 2010)[10]. However , a major disadvantage of resin composite is their tendency to discolor, which may be a major factor in the replacement of restorations.(Al-NegrishAR,et al 2002)[11].

In this study, we focused on the influence of staining of some drinks that are available in Saudi Market on Composite Restorations,As the results showed that Turkish coffee had the worst staining effect in all measurement while Arabic Coffee was the best in causing discoloration, the effect of the other two drinks was similar, this is might be because of the concentration of the caffeine in each drink used,In one study they focused in different brands of tea After measuring the change of color in teeth cycled with tea, drinking water, and artificial saliva, changes were found to be significant in ΔE, Δa, and Δb ($P < 0.05$), compared with the control group. On the other hand, no significant changes were found in ΔL ($P > 0.05$) [Table 1]. Among different brands of tea, in which teeth were placed, maximum change in color was seen with Kaboos tea ($\Delta E = 3.92$), and minimum change was seen in Abo Jabal tea ($\Delta E = 1.60$) (Bandar Al Abdulwahhab et al, 2015)[12].

In other study they focused in different brands of black coffee , the results showed that Dunkin Dunant Coffee had the worst staining effect in the first measurement while Dr. Café Coffee was thebest in causing discoloration, the effect of the other two drinks was similar, this is might be because of the concentration of the caffeine in each coffee used, in the second measurement it was clear that there are changing in the degree of effect on the color of resin composite, Starbucks and Tim Horton drinks were the most effective drinks in staining then dunkindunat while Dr. cafe still the best one in this side,this is might due to the precipitation of the coffee particles on the composite surfaces.In the third measurement all coffee drinks caused nearly the same staining effect except Dr. café which was always the least stained solution.(Felwah Fahad Al-Thunian et al, 2017)[13].

The findings of Bagheri et al. also lent support to the presentstudy, in that, coffee, tea, and red wine caused more discoloration than soy sauce and cola. Coffee had the least and themost discoloration on the first and fourteenth day,respectively. This may be due to the delayed effect ofcoffee on the resin composite discoloration. Adsorptionand absorption can be the cause of coffee discoloration.Coffee includes yellow color causing materials thathave low polarity, which are released with delay andpenetrate to the organic part of the materials, whichmay be due to the matching of the polymeric materialswith the yellow color causing materials in the coffee. (Bagheri R, Burrow et al 2005)[14].

Time has been a dominating factor in a further colorchange in the coffee-soaked samples, as shown by different values of DE found over time. This finding isin confirmation with the findings of Gupta et al[15].

IV.   Conclusion

Within the limitation of this study, it can be concluded that all of these drinks used in this study affected the color stability of tested resin composite materials. The effect of these drinks on the color stability of resin composite depends on type, amount and concentration of each drink. Further studies with longer period of aging are warranted by finding of this study.

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