Strawberry as An Extrinsic Stain Remover

Ita A. Karmawati[1]; Rahaju Budiarti[1]; Ita Yulita[1]
[1]*Department of Dental Nurse of Health Polytechnic Jakarta I*
Correspondence author: itaastit@yahoo.com

Extrinsic stain on teeth can cause by chromogenic materials. Malic acid in strawberries can erode stain. Finding the influence of strawberries in removing extrinsic stain on member of academic of Health's Polytechnic Jakarta I. Quasi experimental with pre post experiment design was used on 22 person with stained 12 upper and lower anterior teeth. Data collected within 5 days, two times a day by smearing teeth with crushed strawberries for 5 minutes, brushed and rinsed. Measure the stain before and after treatment with Lobene Stain Index, then analysed statisticaly. The average of extrinsic stain score change that occurred before and after being treated with strawberries amounted to 2.80. It is proved significant using T test. There is no contribution of sex, age, and chromogenic agents to the decline in extrinsic stain scores after treatment. This study examined extrinsic stain obtained by any chromogenic materials, better outcomes on respondents without chromogenic materials. The conclusion is a decrease in extrinsic stain scores significantly, and strawberries can remove extrinsic stain without being influenced by sex, age, and consumption of chromogenic agents.

Keywords: *extrinsic stain, strawberry*

INTRODUCTION

There are three main types in discoloration of the teeth (Medicine the faculty of CUC of D, 2015):

1. Extrinsic Discoloration; appears if the outer layer of the tooth (email) tarnished. Chromogenic materials such as coffee, wine, cola, drinks or other foods, and smoking also can cause extrinsic stain;
2. Intrinsic Discoloration; this occurs when the structure of the tooth (dentine) becomes dark or yellowish. This condition also can occur when too much fluoride exposed to early age of childhood; consumption of Tetracycline antibiotics in pregnant women during mid-pregnancy; or the use of Tetracycline at the age of 8 years or less;
3. Discoloration Associated with Age; this type is a combination of extrinsic and intrinsic factors.

Food and smoking can stain your teeth in line with the person's age. Tooth whitening using 10% Carbamide Peroxide is the most commonly used in homes, for reasons of safety and effectiveness (Strnad and Imola, 2011). Variations of this technique are known, including the use of higher concentrations of ingredients Carbamide Peroxide (10-22%). Many studies have revealed that different concentrations of bleaching agents will result in a distinct decrease in enamel hardness.

Malic acid contained in strawberries act as a substance that will erode and eliminate some stains on tooth surfaces (Frederick, 2015). Research on the effects of strawberries on teeth with extrinsic stain that have been extracted (Karmawati, Yulita and Budiarti, 2016) concluded that the application of strawberries can change the color of the teeth become lighter and can clean extrinsic stain, while Adawiyah's research in 2004 found that strawberries can be used as tooth whitening. The study aims to determine the effect of strawberries in cleaning teeth with extrinsic stain on member of academic of Health Polytechnic Jakarta I, Ministry of Health, Indonesia.

METHOD

The population in this study is member of Academics on Health Polytechnic Jakarta I, with 22 samples had anterior teeth with extrinsic stain. Using purposive sampling with inclusion criteria samples were all students or employees who are listed as member of academics on Health Polytechnic Jakarta I, having anterior teeth with extrinsic stain

on the left and right sides with the criteria score of the intensity of the extrinsic stain at least 1 point, not allergic to strawberries, and willing to be the subject of research for 5 (five) days without a break with certain restrictions. Quasi Experiment methods with pre-post design of experiment is used to determine the effect of strawberries against tooth cleaning, experiencing extrinsic stain treated after application of strawberries. The dependent variable in this study is strawberries, the independent variable is teeth that free of extrinsic stain, and the confounding variable is a chromogenic materials.

The data were collected by visual observation on the entire surface of the anterior teeth with extrinsic stain that has been affixed with strawberry crush for 5 minutes, and brushing teeth afterwards. Treatment administered twice a day for 5 days. Tools and materials used are a blender, mouth mirror, tweezers, plastic filling instrument, an electric toothbrush, cotton, fruit and fresh strawberries. The observations are recorded for intensity scores and area scores of extrinsic stain (Lobene Stain Index/LSI) (T. He, Dunavent, Fiedler, Baker, 2010). Scoring extrinsic stain on the entire surface of each tooth on the anterior side of the treatment and the control is done before the application of strawberry and at the end of the fifth day. Data were analysed to obtain information about the distribution and ratio of the dependent variable that score extrinsic stain. Further analysis with T-Dependent (pairs) Bivariate Test (Deny, 2008). In this case to determine whether there are differences in extrinsic stain scores before and after treatment with strawberries.

RESULTS

Univariate analysis

Table 1. Characteristic of respondents

Variable	Total	
	n= 22	%
Age		
17-21	10	45,45
22-26	2	9,09
27-31	2	9,09
32-36	2	9,09
37-41	0	0,00
42-46	5	22,73
47-51	1	4,55
Sex		
Male	14	63,64
Female	8	36,36
Chromogenic materials consuming		
Cigarette	9	40,91
Tea	14	63,64
Coffee	10	45,45
Cola drinks	8	36,36
Wine	0	0,00
Chocolate	11	50,00
Colourful fruit/vegetable	12	54,55
Coloured food	8	36,36

Majority of respondents commonly consumed chromogenic materials: tea for as much as 63.64% and those 54.55% of respondents who consume colourful fruit or vegetable, such as dragon fruit, apples, grapes, Dutch eggplant, beets, carrots, potatoes, purple potatoes, and turmeric.

Table 2. Mean Score of Extrinsic Stain before Treatment

Lobene Stain Index	Mean Score
Intensity Score	2,24
Area Score	2,79
Combined Score	5,03

Table 2 shows that mean score of extrinsic stain before the strawberries treatment for Intensity Score is 2.24, Area Score 2.79, and 5.03 for Combined Score.

Table 3. Mean Score of Extrinsic Stain after Treatment

Lobene Stain Index	Mean Score
Intensity Score	1,04
Area Score	1,19
Combined Score	2,23

Table 3 shows that mean score of the extrinsic stain after strawberries treatment is 1.04 for Intensity, 1.19 for Area Score and 2.23 for Combined Score.

Bivariat Analysis

Table 4. The Changes of Extrinsic Stain Scores before and after Treatment

Lobene Stain Index	Mean		
	Before Treatment	After Treatment	Difference Changes
Intensity Score	2,24	1,04	1,20
Area Score	2,79	1,19	1,60
Combined Score	5,03	2,23	2,80

Table 4 showed that Intensity Score, Area Score and Combined Score decreased after treatment with strawberries, where the mean score of amendments is 1.20 for Intensity Score, 1.60 for Area Score, and 2.80 for Combined Score.

Table 5. Results of Analysis Paired Samples Test about Differences between Extrinsic Stain before Treatment and after Treatment with Strawberries

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Int.0 - Int.1	1,20	0,71	0,15	0,89	1,52	7,92	21	0,000
Area.0 - Area.1	1,60	0,73	0,16	1,28	1,92	10,29	21	0,000
Comb.0 - Comb.1	2,80	1,22	0,26	2,26	3,35	10,74	21	0,000

From the analysis of the changes as shown in Table 5, with p value of 0.0001 proved there was significant differences between the Intensity Score, Area Score, and Combined Score respectively before and after treatment with strawberries. Thus strawberries indeed can clean extrinsic stain.

Table 6. Changes of Extrinsic Stain Scores on Respondents Consuming Chromogenic Materials

Chromogenic Materials	Mean Score of Intensity			Mean Score of Area			Mean Score of Combined		
	Before	After	Diff	Before	After	Diff	Before	After	Diff
Cigarettes	2,87	1,75	1,12	3,34	1,93	1,41	6,21	3,68	2,53
Tea	2,11	0,95	1,16	2,67	1,08	1,59	4,79	2,03	2,76
Coffee	2,64	3,15	5,79	1,51	1,64	3,15	1,13	1,51	2,64
Cola Drink	1,84	2,45	4,29	0,59	0,68	1,27	1,26	1,76	3,02
Chocolate	1,84	2,39	4,23	0,58	0,69	1,26	1,26	1,70	2,96
Colourful fruits and vegetables	2,15	2,63	4,78	0,98	1,03	2,01	1,17	1,60	2,77
Colored food	2,39	2,82	5,21	1,14	1,07	2,21	1,25	1,75	3,00

The changes of extrinsic stain score on respondents who consumed chromogenic materials can be seen in Table 6, where the least difference in change is in the respondents who have cigarettes consuming habit, which measured only on the second day to the fifth day. There is a tendency of better results in the intervention group who did not consume chromogenic substances, especially the area. Decrease area greater in those who do not consume a chromogenic substance, with p value 0.045.

Multivariate analysis

Multivariate analysis to see the effect of age, sex and chromogenic materials consumption to the intervention are shown in Table 7, Table 8, and Table 9. It shows that success of the intervention (delta) is determined only by the initial value, no other variables (sex, age, consumption of chromogenic materials) that contribute.

Table 7. Effect of Age, Sex and Consumption of Chromogenic Materials to Intervention Based on Intensity Score

	Unstandardized Coeff		Standardized Coeff	t	Sig.
	B	Std. Error	Beta		
(Constant)	0,768	0,767		1,000	0,331
Age	-0,025	0,014	-0,407	-1,742	0,100
Sex	-0,045	0,322	-0,032	-0,140	0,890
Chromogenic day 2 to 5	-0,112	0,300	-0,079	-0,371	0,715
Int.0	0,559	0,150	0,794	3,734	0,002

Table 8. Effect of Age, Sex and Consumption of Chromogenic Materials to Intervention Based on Area Score

	Unstandardized Coeff		Standardized Coeff	t	Sig.
	B	Std. Error	Beta		
(Constant)	0,618	0,832		0,743	0,468
Age	-0,005	0,019	-0,085	-0,278	0,785
Sex	0,123	0,339	0,085	0,363	0,721
Chromogenic day 2 to 5	-0,481	0,362	-0,332	-1,330	0,201
Area.0	0,414	0,200	0,572	2,071	0,044

Table 9. Effect of Age, Sex and Consumption of Chromogenic Materials to Intervention Based on Combined Score

	Unstandardized Coeff		Standardized Coeff	t	Sig.
	B	Std. Error	Beta		
(Constant)	1,617	1,444		1,120	0,278
Age	-0,026	0,030	-0,244	-0,865	0,399
Sex	0,019	0,593	0,008	0,031	0,975
Chromogenic day 2 to 5	-0,620	0,581	-0,255	-1,067	0,301
Comb.0	0,426	0,166	0,664	2,575	0,020

DISCUSSION

The previous study (Karmawati, Yulita, Budiarti, 2014) conducted on 32 extracted human teeth smeared with strawberries crushed, allowed to stand for 5 minutes, then brushed and rinsed, the treatment was carried out for 5 days and 3 times a day, has proved that there are changes in tooth discoloration and or extrinsic stain thickness between before and after being treated with strawberries. Adawiyah (2004) conducted a study of 30 human teeth were soaked in coffee for 3 days, then rubbed using strawberries as much as 32 times over five days, and concluded that strawberries can be used as extrinsic tooth whitening ingredients. The difference between two researches were on the type of extrinsic stain, which is not limited only to the stain due to coffee consumption, but extrinsic stain obtained for a variety of chromogenic materials. Respondents who did not consume chromogenic materials have better outcomes of intervention result. Decrease area greater in those who did not consume chromogenic materials. This study proved that strawberries can decreased extrinsic stain score due to extrinsic stain thinned out or even disappear, although for consuming cigarettes respondents the reductions smaller than respondents who did not smoking. Same opinion of Wahyudi (2011) and Wright (2013) which says that the malic acid contained in strawberries act as a substance that will erode and eliminate some of the stain on the surface of the tooth.

Multivariate analysis also proves that there is no contribution of age, sex, and consumption of chromogenic materials in the successful cleaning of extrinsic stain with strawberries, which means that strawberries can clean the extrinsic stain on respondents men and women regardless of age although respondents consumed a chromogenic materials. Nevertheless Fredericks (2015) reminded the need for attention that malic acid can break down the enamel that cause decomposition of the teeth, the damage is irreversible, which is often called Enamel Erosion.

CONCLUSION

The most chromogenic materials consumed in the academic community of Health Polytechnic Jakarta I were colourful fruits or vegetables (such as dragon fruit, apples, grapes, Dutch eggplant, beets, carrots, potatoes, sweet purple, and turmeric), followed by the consumption of tea, coffee and cigarettes. Using T-test Dependent (paired test) proved there was significant differences between the Intensity Score, Area Score, and Combined Score respectively before and after treatment. While multivariate analysis shown that success of the intervention (delta) is determined only by the initial value, no other variables (sex, age, consumption of chromogenic materials) that contribute. It can be concluded that strawberries can clean extrinsic stain. The results showed that the decrease in score extrinsic stain after intervention by the application of strawberries is not influenced by sex, age, and consumption of chromogenic materials.

ACKNOWLEDGMENT

1. Ani Nuraeni, SKp, Kes, as Director of the Ministry of Health Polytechnic Jakarta I
2. Dr. Besral, SKM, MSc, as Consultant of Risbinakes
3. drg. Nita Noviani, MKM, as Chairman of Department of Dental Nursing, Health Polytechnic Jakarta I

4. Dr. drg. Jusuf Kris, MM, Kes, as the Head of Research Unit of Health Polytechnic of the Jakarta I and the employee who have helped in this study
5. 5th semester students of Department of Dental Nursing, Health Polytechnic Jakarta I academic year 2014-2015 who have helped in data collection

REFERENCES

Medicine the faculty of CUC of D. 2015. Tooth Discolorations.Aetna inc. http://www.colgateprofessional.com/patient-education/articles/tooth-discoloration, (accessed October 22, 2015)

Strnad G. and Imola B. 2011, Microhardness of Teeth Enamel on Whitening Combined With Remineralization Treatment. Sci Bull "Petru Maior" Univ Targu Mures 8 (XXV)

Frederick J. 2015. What Does Malic Acid Do to Teeth? | LIVESTRONG.COM. http://www.livestrong.com/article/482830-what-does-malic-acid-do-to-teeth/ (accessed October 23, 2015)

Karmawati I.A., Yulita I. and Budiarti R. 2016, "The Effect Of Strawberry On Color Changing Of Tooth With Extrinsic Stain". Paper presented at the 17th KPPIKG annual meeting

Adawiyah R. 2004, Efek Buah Strawberry Dalam Memutihkan Permukaan Gigi Yang Mengalami Diskolorasi Oleh Kopi, Skripsi Universitas Indonesia

He T., Dunavent J.M., Fiedler S.K., Baker R.A.2010. A randomized clinical study to assess the extrinsic staining profiles of stannous- and triclosan-containing dentifrices. Am J Dent. 23 Spec No:22B – 26B http://www.ncbi.nlm.nih.gov/pubmed/21280423 (accessed October 21, 2015)

Deny. 2008. Forum Statistika: Uji T (t-test). WordPress.com. https://ineddeni.wordpress.com (accessed October 23 2015)

Wahyudi. 2011. Khasiat Dan Manfaat Buah Stroberi. Tanaman Obat. http://tanamanbuatobat.blogspot.co.id/2013/02/khasiat-dan-manfaat-buah-stroberi.html (accessed October 23 2015)

Wright C. 2013. Tooth whitening 101: Flash a gorgeous smile with these natural methods. http://www.naturalnews.com/041126_teeth_whitening_oil_pulling_dental_care.html#ixzz3EFruyl27 (accessed October 23 2015)