



## Effect of Black tea as mouth rinse among selected school children with dental plaque

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### Abstract

The prevalence of dental caries is approximately 60% – 65% in India. According to WHO report, dental plaque continues to pose an important public health problem in most developed countries mostly effecting school children. Recently scientists proposed the use of black tea as moth rinse to reduce dental plaques. With this background we planned our study to find out the effectiveness of black tea as mouth rinse among school children with dental plaque, before and after the use of black tea. This interventional study was conducted at a public school in Nellore. About 60 school children with dental plaque were randomly selected for the study. Out of 60 students, 30 were selected for study purpose and the remaining 30 students were recruited as control group. The overall findings of the study showed that the black tea mouth rinse for dental plaque was effective and had brought a change in the level of dental plaque. Our study showed a significant relationship with the use of black tea and decrease in the reduction of dental plaque.

**Keywords:** Black tea, mouth wash, chlorohexane, dental plaque, school children

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### Introduction

Dental plaque is an accumulation of thin film on the outer surface of the tooth [1]. This mainly consists of microorganisms, most of which are bacteria of Streptococcus mutant species [2]. These bacteria are not harmful to the oral cavity generally, but during some extreme conditions, these attack the surface of the tooth [3]. The plaque which is left for more than 12 hours in the mouth, invariably builds up on the teeth, causing the bad breath [4]. The composition of plaque is multivariate, consisting of proteins, carbohydrates, clumps of microorganisms, and other organic and inorganic materials [5]. The amount, as well as the microbial and biochemical composition of plaque, varies with the site of formation, the duration of accumulation, the

composition of the diet, and perhaps other undetermined factors [6]. Mouth washes are recommended after the patient has brushed and flossed his teeth. Market offers a lot of different mouth washes [7]. As an active ingredient they can comprise chlorhexidine, triclosan, fluorides, and metal ions, oxidizing agents, essential oils and many others [8]. With the exception of 0.2% chlorhexidine all mouthwashes are recommended as supplements to everyday oral hygiene [9].

A national survey in Britain indicated that 50% of Children in Scotland aged 3 1/2 to 4 1/2 had experienced plaque and caries of children with active decay, 30% had decay which extended into the dental pulp [10]. According to Dental Council of India and various dental associations, 91% of Indian population suffered from pyorrhea before independence whereas now it is 93%, and more and more people are becoming victims of dental agony after coming to dentists. The prevalence of dental caries is approximately 60% – 65% in India.[11] According to WHO report, dental plaque continue to pose an important public health problem in most developed countries, where it affects 60–90% of schoolchildren and the vast majority of adults. [12] It is also the most prevalent oral disease in several countries in Asia and Latin America.[13] The recommended that any individual can do the mouth

rinse with black tea for every 2 to 3 months in order to retain the fluoride, and to prevent the dental problems at the initial stage.[14]

Aim of our study was to assess pre and post test intervention level of dental plaque among children between 7 to 14 years in experimental and control group and assess the effectiveness of black tea mouth rinse among children between 7-14 years with dental plaque.

### Methodology

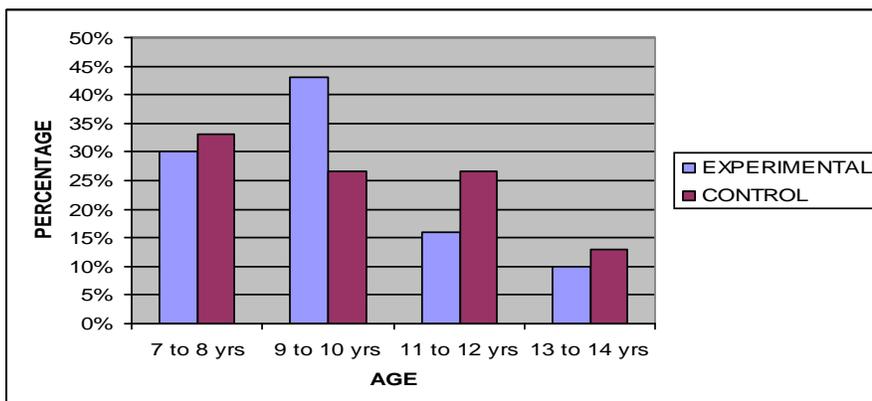
An interventional approach was utilized to find out the effectiveness of the black tea on dental plaque among school children between 7-14 years. The study was conducted in M.S.M. (Mallela Sanjeevaiah memorial) Municipal Corporation high school located in the urban area at Saraswathi Nagar in Nellore. Samples are selected by using Simple random sampling technique by the use of lottery method. Samples were selected by using Simple random sampling technique.

The study was approved by institutional ethics committee and regional medical officer. Oral consent was taken from the school principal and from the parents of children who are recruited for the study after explaining the purpose of the study. A pre- dental assessment was conducted by the researcher on all the children between 7-14 years. 60 children who are having dental plaque are selected for the study. Out of the 60 students, 30 samples for experimental and 30 samples for the control group.

About 2gms of black tea powder is added in 200 ml of hot water, and with the Luke warm temperature the children’s are asked to rinse with warm black tea for 30 seconds, 5 times at 3 minute interval for 2 weeks continuously, which will reduce the dental plaque. The children’s were asked to do the mouth rinse with black tea for dental plaque in the experimental group for 14 days followed by the interpretation with the post dental assessment. Analysis is a process of organizing and synthesizing data in a ways that research questions can be answered and hypothesis tested.

S.no	Demographic Variables	Experimental Frequency	Experimental Percentage	Control Frequency	Control Percentage
1.	<u>AGE</u>				
	7 to 8 yrs	9	30%	10	33%
	9 to 10 yrs	13	43%	8	26.6%
	11 to 12 yrs	5	16%	8	26.6%
2.	<u>Education</u>				
	3 <sup>rd</sup> & 4 <sup>th</sup> class	13	30%	10	33%
	5 <sup>th</sup> & 6 <sup>th</sup> class	17	43%	8	26.6%
	7 <sup>th</sup> & 8 <sup>th</sup> class		16%	8	26.6%
3.	<u>Sex</u>				
	Male		43%	13	43%
	Female		56%	17	56%

**Table 1:** Frequency and percentage distribution of samples based on demographic variables in experimental and control group.



**Figure 1:** frequency and percentage distribution of age among children between 7-14 years in experimental and control group.

**Statistical analysis**

Among 60 children, regarding age 9 (30%) children are in the age group of 7 to 8 years in experimental group and 10 (33%) are in control group, and 13(43%) are in the age group of 9 to 10 years experimental group and 8(26.6%) are in control group, and 5(16%) children are in the age group of 11 to 12 years in experimental group and 8(26.6%) are in control group, and 3(10%) children are in the age group of 13 to 14 years in experimental group

and 4(13%) children are in control group. Regarding education about 9 (30%) children are from 3<sup>rd</sup> & 4<sup>th</sup> class in experimental group and 10 (33%) are in control group, and 13(43%) are from 5<sup>th</sup> & 6<sup>th</sup> class in experimental group and 8(26.6%) are in control group, and 5(16%) children are from 7<sup>th</sup> & 8<sup>th</sup> class in experimental group and 8(26.6%) are in control group, and 3(10%) children are from 9<sup>th</sup> and 10<sup>th</sup> class in experimental group and 4(13%) children are in control group.

No	Criteria	Pre test								Post test							
		Excellent		Good		Fair		poor		Excellent		Good		Fair		Poor	
		F	%	f	%	f	%	f	%	f	%	f	%	f	%	F	%
I	Experimental group	-	-	-	-	4	13.3	26	86.6	3	10	27	90	-	-	-	-
II	Control group	-	-	-	-	2	6.6	28	93.3	-	-	-	-	8	26.6	22	73.3

**Table 2:** Frequency and percentage distribution of pre and post test level of dental plaque in experimental and control group

Study group	Pre test score of dental plaque	Post test score of dental plaque	p Value
Control group	2.26 ± 0.278	2.10 ± 0.237	0.78
Experimental group	2.16 ± 0.252	0.16 ± 0.089	<0.001

**Table 3:** Shows the mean and standard deviation of pre and post test level of dental plaque among children between 7-14 years in both control and experimental group.

Criteria	Mean± SD	P value
1. Post intervention level of dental plaque In experimental group	0.16 ± 0.089	P > 0.09
2. Post intervention level of dental plaque In control group	2.10 ± 0.278	P < 0.05

**Table-4:** Comparison of post intervention level of dental plaque between experimental and control group

It is evident from table -2 among 30 children in experimental group, in pre test- 26 (86.6%) children are in poor level of dental plaque, and 4(13.3%) children are in fair rating level., where as in post test after experimenting with the black tea mouth rinse 27(90%) children were in good level and 3(10%) are in excellent rating level. Among 30 children in control group, in pretest 28(93.3%) children are in poor level of dental plaque, and 2(6.6%) children are in fair level, where as in post test 73.39% children are in poor level of dental plaque and 8(26%) children are in fair level of dental plaque.

Regarding sex 13(43%) children are males in experimental group and 13(43%) are in control group, and 17(56%) children are females in experimental group and 17(56%) are in control group. Regarding monthly income of the parents 5(16%) children are from monthly income of 2000-4000 in experimental group and 6(20%) are in control group and 9(30%) children are from monthly income of 4001 -6000 in experimental group and 9(30%) are in control group, and 7(23%) children are from monthly income of 6001-8000 in experimental group and 9(30%) are in control group, and 8(26%) children are from monthly income of 8000-10000 in

experimental group and 5(16%) are in control group, and 1(3.3%) children are from monthly income of > 10000 in both experimental and control group. Table - 1 shows demographic features of the study subjects. Table - 2: frequency and percentage distribution of pre and post test level of dental plaque in experimental and control group. Table – 3: To assess the pre and post test levels of dental plaque in experimental and control group. To compare the post intervention level of dental plaque in experimental and control group. Table –4: To compare the pre and post intervention level of dental plaque in experimental group.

## Discussion

The aim of the study was to assess the effectiveness of black tea mouth rinse among children between 7-14 years with dental plaque at selected school at saraswathi Nagar Nellore. A total of 60 children were selected through simple random sampling and the study was conducted using experimental design, and pre test was conducted by using standardized tool, and for experimental group the black tea is given as intervention, then the post test was done.

The first objective was to assess the pre and post test intervention level of dental plaque among children between 7-14 years in experimental and control group. Table-2 shows that Among 30 children in experimental group, in pre test- 26 (86.6%) children are in poor level of dental plaque, and 4(13.3%) children are in fair rating level., where as in post test after experimenting with the black tea mouth rinse 27(90%) children were in good level and 3(10%) are in excellent rating level. Among 30 children in control group, in pretest 28(93.3%) children are in poor level of dental plaque, and 2(6.6%) children are in fair level, where as in post test 73.39%) children are in poor level of dental plaque and 8(26%) children are in fair level of dental plaque. Table-3 shows that in pretest the overall level of dental plaque mean value was 2.16, with standard deviation of 0.252, and where as in post test the mean value is 0.16 with standard deviation score of 0.089 in experimental group. Table-4 shows that in pretest the overall level of dental plaque mean value was 2.26, with standard deviation of 0.278, where as in post test the mean value is 2.10 with standard deviation score of 0.237 in control group.

The second objective is to assess the effectiveness of black tea mouth rinse among children between 7-14 years with dental plaque. Table – 4 shows that , the post test experimental

group mean was 0.16 and standard deviation was 0.089 , the post test control group mean was 2.10 and standard deviation was 0.278, the independent “t” test value is + 21.3 and the table value is 2.58(p<0.05). So there is a statistical significant improvement in the reduction of the dental plaque Level after experimenting with black tea mouth rinse in experimental group.

Christina Wu, in 2001, found that compounds in black tea were capable of killing or suppressing growth and acid production of cavity-causing bacteria in dental plaque [15]. Black tea also affects the bacterial enzyme glucosyltransferase which is responsible for converting sugars into the sticky matrix material that plaque uses to adhere to teeth. In addition, certain plaque bacteria, upon exposure to black tea, lost their ability to form the clumpy aggregates with other bacteria in plaque, thereby reducing the total mass of the dental plaque. The study conducted in Dr. Wu's lab found that when volunteers rinsed with black tea for 30 seconds five times at 3-minute intervals plaque bacteria stopped growing and producing acid, which breaks down the teeth and causes cavities. This research supports an earlier Swedish study that found rinsing the mouth with black tea significantly reduced plaque build-up. Black tea can help fight cavities and prevent gum disease, according to research presented at the annual American Society for Microbiology meeting [16]. The study included several trials in which volunteers rinsed their mouths with black tea at different intervals. In one trial, those who rinsed with black tea for one minute 10 times a day had less plaque accumulation. In another, a single 30-second rinse had less effect, but multiple rinsing prevented bacteria from further growth and lowered acid production.” If sequenced properly between meals and normal oral hygiene, drinking black tea could reduce the number of cavities and prevent periodontal disease,"

The third objective is to associate the results of experimental group with selected demographic variables. By using chi-square, it was found that statistically there was no significant association between the age, sex, education and religion and income of the parents. The overall findings of the study showed that the black tea mouth rinse for dental plaque was effective and had brought a change in the level of dental plaque. On the whole the study accepts the hypothesis which was formulated at the beginning of the study. There is a significant

relationship between the effectiveness of black tea and decrease in the reduction of dental plaque.

## Conclusion

This study showed that on the whole the study accept the hypothesis which was formulated at the beginning of the study. There is a significant relationship between the black tea mouth rinse and decrease in the dental plaque. This study has proved that there is an effectiveness of black tea mouth rinse for dental plaque among children. Among 30 children in experimental group, in pre test- 26 (86.6%) children are in poor level of dental plaque, and 4(13.3%) children are in fair rating level, where as in post test after experimenting with the black tea mouth rinse 27(90%) children were in good level and 3(10%) are in excellent rating level. Among 30 children in control group, in pretest 28(93.3%) children are in poor level of dental plaque, and 2(6.6%) children are in fair level, where as in post test 73.39%) children are in poor level of dental plaque and 8(26%) children are in fair level of dental plaque. The calculated value is greater than the table value so there is an effectiveness of black tea mouth rinse on dental plaque. Calculated value is greater than the table value so the study shows that black tea mouth rinse is effective on dental plaque. Research study recommended that any individual can do the mouth rinse with black tea for every 2 to 3 months in order to retain the fluoride, and to prevent the dental problems at the initial stage. Health education booklets, pamphlets and leaflets can be given to the community who are able to read in the local language regarding benefits and the way of usage of black tea mouth rinse.

## References:

1. Brex, Michel, et al. "Early formation of dental plaque on plastic films." *Journal of periodontal research*. 1981; 16(2): 213-227.
2. Kleinberg, Israel. "A mixed-bacteria ecological approach to understanding the role of the oral bacteria in dental caries causation: an alternative to *Streptococcus mutans* and the specific-plaque hypothesis." *Critical Reviews in Oral Biology & Medicine* 2002; 13(2): 108-125.
3. Hillson, Simon W. "Diet and dental disease." *World Archaeology* 1979; 11(2): 147-162.
4. Theilade, Else. "Factors controlling the microflora of the healthy mouth." *Human microbial ecology*. 1990: 1-56.
5. Heidema, A. Geert, et al. "The association of 83 plasma proteins with CHD mortality, BMI, HDL,

and total-cholesterol in men: applying multivariate statistics to identify proteins with prognostic value and biological relevance." *Journal of proteome research* 2009; 8(6): 2640-2649.

6. Dennis, D. Adele, et al. "Effects of sodium trimetaphosphate supplementation of a high sucrose diet on the microbial and biochemical composition of four-day plaque and on urine calcium and phosphorus levels." *Journal of dental research* 1976; 55(5): 787-796.
7. Wolfe, Stanton H., and W. Penn Handwerker. "Where Bad Teeth Come from: A Study in How Cultures Exert Causal Force." *Where Bad Teeth Come from: A Study in How Cultures Exert Causal Force* (December 15, 2009).
8. Pan, Pauline, et al. "Oral care compositions comprising tropolone compounds and essential oils and methods of using the same." U.S. Patent No. 6,689,342. 10 Feb. 2004.
9. Netuschil, L., T. Hoffmann, and M. Brex. "How to select the right mouthrinses in periodontal prevention and therapy. Part I. Test systems and clinical investigations." *International journal of dental hygiene* 2003; 1(3): 143-150.
10. Sheiham, Aubrey. "Dietary effects on dental diseases." *Public health nutrition* 2001; 4(2)b: 569-591.
11. Ayoob, Sulaiman, and Ashok Kumar Gupta. "Fluoride in drinking water: a review on the status and stress effects." *Critical Reviews in Environmental Science and Technology* 2006; 36(6): 433-487.
12. Jones, Sheila, et al. "The effective use of fluorides in public health." *Bulletin of the World Health Organization* 2005; 83(9): 670-676.
13. Animal, Metabolic Profile In An. "Moderated Poster (Oral) Presentations." *J Sex Med* 2008; 6(2): 145-193.
14. Kelleher M. "Dental Bleaching: Methods." *Minimally Invasive Esthetics: Essentials in Esthetic Dentistry Series* 2015: 51
15. Vinson, Joe A., Karolyn Teufel, and Nancy Wu. "Green and black teas inhibit atherosclerosis by lipid, antioxidant, and fibrinolytic mechanisms." *Journal of agricultural and food chemistry* 2004; 52(11): 3661-3665.
16. Gardner, E. J., C. H. S. Ruxton, and A. R. Leeds. "Black tea—helpful or harmful? A review of the evidence." *European Journal of Clinical Nutrition* 2007; 61(1): 3-18.