

# Effect of oral health education and fluoridated dentifrices on the oral health status of visually impaired children

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## Abstract

Visually impaired children are challenged everyday in their everyday skills. Oral hygiene practices among visually impaired children require a special approach with time and patience. The purpose of this study was to evaluate the effect of oral health education and fluoridated dentifrices on the oral health status of visually impaired children. **Materials and Methods:** Fifty visually impaired children between 8 and 12 years of age formed the study group. Oral health education and motivation was done with the help of Braille. Modified Bass method of brushing was taught to the children and the required dental treatment was done. Subjects were randomly divided into two equal groups fluoridated and non-fluoridated. Oral hygiene index -simplified, DMFT, deft index, and Streptococcus mutans and Lactobacillus count were assessed at baseline, immediately after the treatment and at 3, 6, and 12 month intervals. The oral health awareness was assessed using a questionnaire at the beginning and end of the study. **Results:** At baseline, the mean OHI-S, DMFT and deft scores were 2.72, 0.47, and 0.51 respectively. At the end of 12 months there was a significant decrease in OHI-S scores in the fluoridated group. No significant difference was seen in DMFT and deft between the fluoridated and non-fluoridated groups at the different time interval. After the oral health education and comprehensive treatment there was a reduction in Streptococcus mutans and Lactobacillus counts in both groups; however, at the end of 3, 6, 12 months there was a significant decrease in fluoridated group as compared to the non-fluoridated. The oral health awareness increased significantly at the end of the study. **Conclusion:** The oral health education and motivation formulated for the visually impaired children was effective in improving their oral health status. Fluoridated dentifrices decreased the Streptococcus mutans and Lactobacillus counts and improved the oral hygiene status.

**Keywords:** Dentifrices, oral health status, visually impaired children

## Introduction

“The best and the most beautiful things in the world cannot be seen or even touched. They must be felt with the heart” – Hellen Keller. Blindness is defined by WHO as having a “visual acuity of less than 3/60 m or corresponding visual field loss in the better eye with the best possible correction,” meaning that whilst a blind person could see 3 m, a non-visually impaired person could see 60 m. Visual impairment relates to a person’s eyesight, which cannot be corrected to normal vision.<sup>[1]</sup>

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The oral health of people who are visually impaired can be disadvantaged, as they are not in a position to detect and recognize the early oral disease and may be unable to take immediate action unless informed of the situation. Hence adequate instruction and proper care of teeth and oral tissues are essential.

The visually impaired depend much more on sound, speech, and touch, to orient them to a situation.<sup>[2]</sup> Hence the oral health education should be modified to accommodate their handicap. Tooth brushing is recommended as an official dental health education material and by many dentists as one of the main means of preventing gingivitis and dental caries. A correlation between good oral hygiene and gingival health has been clearly demonstrated in both adults and children. The use of fluoridated dentifrice is one of the most common ways of delivering topical fluorides in developed countries, and results from clinical trials have shown that it is an effective caries prevention method.<sup>[3]</sup>

Streptococcus mutans and Lactobacilli are reputed to be the main etiologic agents of dental caries in humans. As Streptococcus mutans detected in saliva is thought to be shed from plaque biofilm and correlates well with salivary mutans streptococci counts. It is useful for assessing caries risk.<sup>[3]</sup> Hence, this study aims to evaluate the effect of fluoridated dentifrices on Streptococcus mutans and Lactobacilli. The study also assessed the influence of oral health education on the oral health status of visually impaired children.

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## Materials and Methods

In the present study 50 healthy visually impaired children between the age of 8 and 12 years were selected by purposive sampling method. The selected children were totally visually impaired with prior parental and institutional consent. Those children who were unable to comply with the follow-up visits and with history of hypersensitivity to fluoride dentifrices were excluded from the study.

The children on the first visit were examined and the findings were recorded in the proforma. The general information of the patient and the readings hard-tissue examination, which included teeth present, DMFT, deft Index, OHI-S indices were recorded. The Tell-feel-do technique was employed to record the OHI-S, DMFT and deft indices.

The children were asked to chew paraffin wax for 2 min and stimulated saliva was collected in sterile collection tubes, sealed and transported immediately to the laboratory, to assess the salivary mutans streptococci and Lactobacilli count. Comprehensive dental treatment required by the children was done. Immediately after treatment DMFT, deft, OHI-S indices and salivary mutans streptococci and Lactobacilli count was assessed in these children. A questionnaire, which assessed their knowledge about dental caries, tooth brushing, dentifrices, eating habits, etc., were given to each of these children. The questionnaire was read and the answers obtained were entered. Their awareness level was assessed based on the number of questions correctly answered.

The children then received one-to-one oral health education and motivation in accordance with the skills, impairment and requirements of each individual with the help of dental models and tooth brushes. Modified Bass method of brushing was taught to the children using the models. Instructions were given to the children in Braille. The children were then randomly divided into two groups of 25 each. Group I: Comprised of 25 children who were given

fluoridated dentifrices. Group II: Comprised of 25 children who were given non-fluoridated dentifrices. The children were recalled at 3, 6, and 12 months, a new tooth brush and dentifrices were given to each child during their recall visits. On each visit, DMFT, deft, OHI-S indices, and salivary mutans streptococci and Lactobacilli counts were assessed. The brushing technique and oral health education instructions was reinforced periodically. At the end of 12 months the same questionnaire was given to each child to assess their level of oral health awareness and was scored accordingly.

## Results

Table 1 shows OHI-S between the two groups at different time intervals. The OHI-S was found to be significantly low in the fluoridated group at the 12 months time interval ( $P < 0.05$ ).

Table 2 shows DMFT and deft between the two groups at different time intervals. Difference in mean DMFT and deft between fluoridated group and non-fluoridated group was not found to be statistically significant at any time intervals.

Table 3 shows Streptococcus and Lactobacillus colonies count between the two groups at different time intervals. The mean Streptococcus mutans and Lactobacillus was found to be significantly lower in the fluoridated group at 3, 6, and 12 months time interval ( $P < 0.05$ ).

Table 4 shows a negative correlation between oral health awareness and the OHI-S index at baseline, but at the end of 12 months, there was a positive correlation.

## Discussion

Visual impairment relates to a person's eyesight, which cannot be corrected to normal vision. Nandini *et al.* assessed oral health status and hygiene practices in 150 visually impaired children, out of which 37.3% of the participants were affected by dental caries and 71.3% by gingivitis.<sup>[4]</sup> Hence, there is utmost need of individual training in oral care and

**Table 1: Evaluation and comparison of OHI-S between two groups at different time interval**

Time interval	Group	N	Mean	SD	Mean difference	't' value	'P' value
Baseline	Fluoridated group	25	2.626	0.351	-0.192	-1.707	0.100
	Non-fluoridated group	25	2.818	0.440			
Immediately	Fluoridated group	25	0.000	0.000	0.000	0.000	0.000
	Non-fluoridated group	25	0.000	0.000			
3 months	Fluoridated group	22	1.919	0.648	-0.191	-1.008	0.325
	Non-fluoridated group	24	2.110	0.638			
6 months	Fluoridated group	22	1.783	0.330	-0.009	-0.085	0.933
	Non-fluoridated group	24	1.792	0.382			
12 months	Fluoridated group	22	0.878	0.276	-0.277	-3.850	0.001*
	Non-fluoridated group	24	1.155	0.203			

\*Denotes statistical significance, OHI-S=Oral hygiene index -simplified, SD=Standard deviation

**Table 2: Evaluation and comparison of DMFT, deft between two groups at different time intervals**

Time interval	Group	N	Means		SD		Median		Mean difference		't' value		'P' value	
			DMFT	Deft	DMFT	Deft	DMFT	Deft	DMFT	Deft	DMFT	Deft	DMFT	Deft
Baseline	Fluoridated group	25	0.230	0.500	0.430	1.010	0.000	0.000	-0.490	-0.020	-0.652	-0.010	0.515	0.990
	Non-fluoridated group	25	0.720	0.520	1.370	1.050	0.000	0.000						
Immediately	Fluoridated group	25	0.230	0.500	0.430	1.010	0.000	0.000	-0.490	-0.020	-0.652	-0.010	0.515	0.990
	Non-fluoridated group	25	0.720	0.520	1.370	1.050	0.000	0.000						
3 months	Fluoridated group	22	0.230	0.500	0.430	1.010	0.000	0.000	-0.490	-0.292	-0.650	-1.014	0.515	0.310
	Non-fluoridated group	24	0.720	0.520	1.370	1.250	0.000	0.000						
6 months	Fluoridated group	22	0.230	0.500	0.430	1.010	0.000	0.000	-0.606	-0.292	-1.194	-1.014	0.233	0.310
	Non-fluoridated group	24	0.830	0.790	1.370	1.250	0.000	0.000						
12 months	Fluoridated group	22	0.230	0.500	0.430	1.010	0.000	0.000	-0.606	-0.292	-1.194	-1.014	0.233	0.310
	Non-fluoridated group	24	0.830	0.790	1.370	1.250	0.000	0.000						

DMFT=Decayed missing filled teeth, \*Denotes statistical significance, SD=Standard deviation

**Table 3: Evaluation and comparison of streptococcus, lactobacillus between two groups at different time intervals**

Strepto coccus mutans/ lacto bacillus	Group	N	Mean ( $\times 10^3$ CFU/ml)		SD		Mean difference		't' value		'P' value	
			S. Mutans	Lacto bacillus	S. Mutans	Lacto bacillus	S. Mutans	Lacto bacillus	S. Mutans	Lacto bacillus	S. Mutans	Lacto bacillus
Baseline	Fluoridated group	25	316.680	85.880	91.794	27.431	24.640	-9.800	0.887	-0.926	0.384	0.818
	Non-fluoridated group	25	292.040	95.680	104.276	45.277						
Immediately	Fluoridated group	25	169.920	65.680	67.175	23.885	2.520	-17.160	0.162	-1.725	0.872	0.090
	Non-fluoridated group	25	167.400	82.840	38.932	43.631						
3 months	Fluoridated group	22	118.360	48.280	44.566	23.064	-93.307	-27.970	-6.976	-4.239	0.000*	0.001*
	Non-fluoridated group	24	211.667	76.250	48.851	21.557						
6 months	Fluoridated group	22	107.480	42.480	39.378	16.353	-78.228	-24.937	-6.960	-4.643	0.000*	0.001*
	Non-fluoridated group	24	185.708	67.417	39.288	20.017						
12 months	Fluoridated group	22	89.960	35.880	32.603	10.228	-60.415	-28.953	-7.467	-11.297	0.000*	0.001*
	Non-fluoridated group	24	150.375	64.833	23.463	6.598						

\*Denotes statistical significance, CFU=Colony forming units

**Table 4: Correlation between oral health awareness and the OHI-S index**

Recall schedule	No. of students	Level of awareness	OHI-S	Correlation
Baseline	50	3.621	3.021	-0.188
12 months	46	8.978	0.970	+0.728

OHI-S=Oral hygiene index- Simplified

plaque control in order to reduce the prevalence of dental caries among visually impaired children.

Teaching good oral hygiene practices among visually impaired children requires a special approach with time and patience. Most programs rely on tactile senses. In the present study,

the patients were assisted in exploring oral structures of the mouth with the help of models. Children received one-to-one oral health education and motivation in accordance with the skills, impairment and requirement. Modified Bass method of brushing was taught. Oral hygiene instructions were converted into braille with the help of braille instructor and each child received a copy. Oral health education was reinforced on a one-to-one basis periodically.

The present study showed a decrease in the mean OHI-S scores at all time intervals in both the fluoridated and non-fluoridated groups as compared to the baseline; however, there was a significant difference in fluoridated group at the 12 months interval. As visually impaired children are able to

comprehend and have normal motor skills, periodic education and motivation helped in their oral hygiene maintenance. Children were asked to read the instructions given to them periodically. As these instructions were written in Braille, they did not require any additional support. However, only towards the 5<sup>th</sup> month it was noticed that almost all the children had developed the modified Bass technique and also religiously brushed twice-a-day with stipulated amount of dentifrice. Studies have also shown that fluoridated dentifrices did not increase calculus accumulation.<sup>[5,6]</sup> This could be the reason for the significant decrease in the mean OHI-S in fluoridated group at the 12-month interval.

The present study also compared DMFT and deft between the fluoridated and non-fluoridated groups. The results showed no difference in the DMFT and deft at 3 months. But at 6 months, there was a marginal increase in non-fluoridated group, which was not statistically significant. This could be due to the meticulous way in which these children followed the oral hygiene instruction. However, long-term study is essential to substantiate these results as our study was done only for a period of 12 months. This study showed a decrease in the Streptococcus mutans and Lactobacilli colonies count in both the fluoridated and non-fluoridated groups immediately after the treatment; however, there was significant difference in mean Streptococcus mutans and Lactobacilli colonies count in fluoridated group at 3, 6, and 12 months time intervals. The decrease in both the groups immediately could be due to comprehensive treatment done in the beginning of the study. These results were similar to a study done by Twetman *et al.* who demonstrated that the post-treatment levels of mutans streptococci and Lactobacilli were significantly lower than the pre-treatment levels.<sup>[7]</sup> The significant decrease in the Streptococcus mutans and Lactobacilli colonies count in the fluoridated group at 3, 6, and 12 months could be due to fluoride's bactericidal action. It inhibits many enzymes essential for cell metabolism and growth either directly or in the form of metal complexes at submolecular levels like enolase.<sup>[8]</sup> Yoshihara *et al.* stated that children with long-term use of fluoride mouth rinse had lower-levels of Streptococcus mutans.<sup>[9]</sup>

Oral health awareness at baseline showed a negative correlation with OHI-S index, whereas at the end of 12 months there was a positive correlation. The awareness had increased from 3.62 to 8.97 at the end of the study. This would be due to the periodic education along with the instructions in given to them, which was in Braille. This was in accordance with a study by Ercalik *et al.* who conducted a 24-item verbal questionnaire to record their general health, impairment, the socio-economic profile and education level of their parents, oral health knowledge, sources of information about oral health, awareness of sugar in-take/

caries risk, frequency of dental check-ups and oral hygiene habits, as well as any difficulties they experienced.<sup>[10]</sup> Hence, periodic education and motivation effectively improved the oral hygiene status of the visually impaired children.

## Conclusion

The present showed a decrease in OHI-S in both groups at all time intervals but at the end of 12 months there is a significant decrease in fluoridated group. The mean DMFT and deft did not show any significant changes in both the groups.

The Streptococcus mutans and Lactobacillus colonies count decreased immediately after treatment in both groups. However, at 3, 6, and 12 months there was a significant decrease in the fluoridated group. In addition, there was a marked improvement in the oral health awareness of these visually impaired children at the end of the study. Thus oral health education and the use fluoridated dentifrices effectively improved the oral health status of these children.

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