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## Comparison on the effect of oral hygiene status before and after supervised oral health maintenance in special children

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### Abstract

**Introduction:** The dental health of people with disabilities has been reported to be worse than that of normal people. Maintenance of oral hygiene by tooth brushing is the most important and effective way of reducing levels of plaque and gingivitis.

**Aim:** To evaluate the effectiveness of supervised tooth brushing in various special schools of Mathura district.

**Materials and Methodology:** 160 subjects (6-14years) were selected for the study and the participants were divided into four groups depending upon their disability as: Down's syndrome, Cerebral palsy, Autism spectrum disorder & Hearing impaired. Baseline of half of the subjects were maintained; Gingival & plaque index were recorded followed by oral hygiene instructions to all the children, supervising staff and caregivers. Plaque and gingival index were recorded again in 3 months and again reminded the taught technique & subsequently a 6 months follow-up.

**Result:** Gingival health status was improved in all the groups. Statistical significant result was found in Plaque index of hearing impaired whose baseline were maintained and statistical analysis was done using paired t-test.

**Conclusion:** School based dental programs for oral health education should be done regularly and frequently as it will help in avoiding the expensive and lengthy dental procedures.

**Keywords:** Down's syndrome, cerebral palsy, autism, hearing impairment, plaque index, gingival index

### Introduction

"The American Academy of Pediatric Dentistry (2012)" defines special health care needs as "any physical, developmental, mental, sensory, behavioral, cognitive, or emotional impairment or limiting condition that requires medical management, health care intervention, and/or use of specialized services or programs. The condition may be congenital, developmental, or acquired through disease, trauma, or environmental cause and may impose limitations in performing daily self-maintenance activities or substantial limitations in a major life activity. Health care for individuals with special needs requires specialized knowledge, as well as increased awareness and attention, adaptation, and accommodative measures beyond what are considered routine" [1]. Dental caries and periodontal diseases exert massive, social, economical and financial burden on global scale [2]. According to the world Health Organization, 10% of the total population comprises of individuals with disabilities in developed countries and 12 % in the developing countries [3-5]. Dental plaque is the primary etiological factor in periodontal diseases. Gingivitis and severity of periodontal disease can be prevented by the eradication and control of plaque formation. The dental health of people with disabilities has been reported to be worse than that of normal people since they lack dental care, have a great number of untreated decayed teeth, and have a more severe periodontal status compared with normal people of the same age. One of the primary factors influencing the prevalence of dental disease in special child is the inability to maintain proper oral hygiene [6]. In a child with special health care needs, frequently there is difficulty in maintaining their oral hygiene, so oral hygiene methods may need to be simplified or modified to suit the individual situation according to their disability.

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Tooth brushing is the principal method used for maintaining oral hygiene and its appropriate frequency is the most important and effective way of reducing levels of plaque and gingivitis [7]. When this habit is taught in the early childhood, it is naturally ingrained in the daily routine of the child, with only positive reinforcement needed [8, 9]. There are various studies concerning the dental health of normal child but a very little attention has been given to the dental health of a special child, who actually requires special care and attention. Thus, the present study is designed with the objective to evaluate the effectiveness of supervised tooth brushing in various special schools of Mathura district.

## Materials and methodology

### Study design

The comparative study was conducted after taking approval from the ethical committee of K.D. Dental College and Hospital, Mathura and after acceptance from various special schools in Mathura city. Parents consent forms were signed before the study.

To select the samples, the following criterias were used:

### Inclusion criteria

- 1) Children aged between 6-14 years.
- 2) Children who are co-operative.
- 3) Subjects that are present on the day of dental examination.
- 4) Both boys and girls were included in the study.

### Exclusion criteria

- 1) Subjects suffering from major systemic illness.
- 2) Children who are not willing to participate.

The study consist of a total number of 160 children between the age of 6 to 14 years from three different schools of differently abled children which are

- 1) Kalyanam Karoti,
- 2) Vatsalyagram special School and
- 3) AAWA, Asha Special School.

The total subjects were divided into four groups:

- 1) Children with Down's syndrome (n=40)
- 2) Children with Autism (n=40)
- 3) Children with Cerebral Palsy (n=40)
- 4) Children with hearing impaired (n=40).

The children were again subdivided into two groups of 20 each in numbers. One subgroup consist of those maintaining the baseline level at zero by oral prophylaxis and the another subgroup consist of those whose baseline level were not maintained at zero.

The aim, objectives and the procedure of the study were thoroughly explained to the concerned authorities. Baseline level of half of the children i.e. 20 in each group were maintained at level zero by oral prophylaxis. The baseline level of the other half were taken through dental examination.

### Dental examination

The dental examination was done in the schools where the subjects were made to sit on a normal chair and natural day light were used as a light source. Plaque index were taken using Silness and Loe (1967) method by the use of mouth mirror, explorer and chip blower. The Gingival index were also taken using Silness and Loe (1963) method.

After taking the indices it is followed by small talks in fun learning manner by the use of colorful pictures, small cartoon videos showing about the value of oral health in order to make the child understand. And finally, demonstration about tooth brushing is done to everyone [Fig.1, 2] including their staff members and caregivers. Fone's method of tooth brushing was demonstrated on the tooth model and some children were made to practice on the model and they were asked to brush their teeth twice daily [Fig.3]. For those with hearing impaired sign language were used to convey the information about their oral health with the help of their instructor. All the staff members were asked to remind the taught brushing method daily to the students and the caregiver to help those who have difficulty in grip. Follow ups were done in 3 months and 6 months and plaque and gingival index were taken again and oral hygiene instructions with the talks were repeated again. In between visits were made to remind the children about the tooth brushing method.



Fig 1: Educating the children about tooth brushing on a tooth model



Fig 2: Motivational instruction of tooth brushing using power point presentation



Fig 3: Making the child practice on a tooth model

**Statistical analysis:** After completing the period of 6 months, data analysis was done using Statistical Packages for Social Sciences (SPSS) version 17.0 statistical analysis software. Paired t-test was used for the parametric variables like plaque index (P.I.) and gingival index (G.I.). All statistic tests were at

a 95% of confidence and statistical significance level was defined at  $p < 0.05$ .

**Observations and results**

**Table 1:** Status of Plaque & Gingival index for those whose baseline were maintained

Groups	Paired t-test	N	Mean	S.D	Mean Difference	t -test	P-Value	Inference
Cerebral palsy	PL 3M	20	1.23	0.66	-0.073	0.337	0.740	NS
	PL 6M	20	1.31	0.77				
Down's syndrome	PL 3M	20	0.80	0.51	-0.417	1.511	0.147	NS
	PL 6M	20	1.22	0.95				
Autism	PL 3M	20	1.11	0.77	-0.066	0.454	0.655	NS
	PL 6M	20	1.18	0.65				
Hearing impaired	PL 3M	20	0.84	0.49	0.309	1.977	0.063	NS
	PL 6M	20	0.54	0.29				
Cerebral palsy	GI 3M	20	0.68	0.57	0.176	0.978	0.341	NS
	GI 6M	20	0.50	0.56				
Down's syndrome	GI 3M	20	0.38	0.38	-0.137	0.803	0.432	NS
	GI 6M	20	0.52	0.54				
Autism	GI 3M	20	0.46	0.48	-0.129	1.009	0.325	NS
	GI 6M	20	0.59	0.47				
Hearing impaired	GI 3M	20	0.33	0.27	0.222	2.914	0.009	S
	GI 6M	20	0.11	0.18				

The Plaque scores in the baseline maintained individuals at the end of 3-months and 6-months follow-up increased in Cerebral Palsy, Down’s syndrome and Autism whereas in hearing impairment the mean value increases at 3-months and there is gradual decline at the end of 6-months [Table no.1].The p-value of plaque index in all the four groups for those with baseline zero came out to be statistically non-

significant. The mean gingival index from baseline to 3 months increases in all the four groups and again there is gradual decline at the end of 6 months in Cerebral Palsy and Hearing impaired children while the other two increases [Table no.1]. The p-value in hearing Impairment came out to be statistically significant (0.009) while the other three were non-significant.

**Table 2:** Status of Plaque index for those whose baseline were not maintained

Groups	Time	N	Mean	S.D	Mean Difference	t -test	P-Value	Inference
Cerebral palsy	PL BL	20	1.07	0.46	-0.044	0.212	0.834	NS
	PL 3M	20	1.11	0.82				
	PL BL	20	1.07	0.46	0.065	0.355	0.727	NS
	PL 6M	20	1.00	0.69				
	PL 3M	20	1.11	0.82	0.109	0.491	0.629	NS
	PL 6M	20	1.00	0.69				
Down's syndrome	PL BL	20	1.08	0.48	-0.055	0.262	0.796	NS
	PL 3M	20	1.13	0.77				
	PL BL	20	1.08	0.48	-0.082	0.382	0.707	NS
	PL 6M	20	1.16	0.91				
	PL 3M	20	1.13	0.77	-0.027	0.104	0.918	NS
	PL 6M	20	1.16	0.91				
Autism	PL BL	20	0.87	0.43	-0.199	1.604	0.125	NS
	PL 3M	20	1.07	0.59				
	PL BL	20	0.87	0.43	-0.172	1.431	0.169	NS
	PL 6M	20	1.04	0.46				
	PL 3M	20	1.07	0.59	0.027	0.186	0.855	NS
	PL 6M	20	1.04	0.46				
Hearing impaired	PL BL	20	1.00	0.47	0.276	1.972	0.063	NS
	PL 3M	20	0.73	0.43				
	PL BL	20	1.00	0.47	0.078	0.48	0.637	NS
	PL 6M	20	0.93	0.60				
	PL 3M	20	0.73	0.43	-0.198	-1.399	0.178	NS
	PL 6M	20	0.93	0.60				

For those whose baseline level were not maintained, there is slight increase in mean Plaque index from the first visit to 3 months and then reduction at the end of 6 months in cerebral palsy children [Table 2, Bar diagram-9]; there is gradual increase in Down’s syndrome as well as in autistic children at the end of 6 months follow up [Table 2,]; in hearing impaired group slight improvement can be observed at the 3 months

follow-up and again slight improvement at the end of 6 months [Table 2]. All the p-values came out to be statistically non-significant ( $p < 0.05$ ). There is improvement in the mean gingival index for Cerebral palsy, Down’s syndrome as well as Autistic children [Table 3] whereas in hearing impairment there is gradual reduction at the end of 3 months and again slight improvement at the end

of 6 months [Table 3]. All the p value came out to be non-significant except for autistic children from the first visit to 3

months which came out to be statistically significant (p=0.031).

**Table 3:** Status of Gingival index for those whose baseline were not maintained

Groups	Time	N	Mean	S.D	Mean Difference	t -test	P-Value	Inference
Cerebral palsy	GI BL	20	0.83	0.49	0.017	0.086	0.932	NS
	GI 3M	20	0.81	0.78				
	GI BL	20	0.83	0.49	0.264	1.699	0.106	NS
	GI 6M	20	0.56	0.48				
	GI 3M	20	0.81	0.78	0.248	1.195	0.247	NS
	GI 6M	20	0.56	0.48				
Down's syndrome	GI BL	20	0.78	0.52	0.107	0.555	0.585	NS
	GI 3M	20	0.67	0.66				
	GI BL	20	0.78	0.52	0.17	0.905	0.377	NS
	GI 6M	20	0.61	0.61				
	GI 3M	20	0.67	0.66	0.064	0.324	0.749	NS
	GI 6M	20	0.61	0.61				
Autism	GI BL	20	0.7	0.43	0.292	2.335	0.031	S
	GI 3M	20	0.41	0.45				
	GI BL	20	0.7	0.43	0.232	1.63	0.12	NS
	GI 6M	20	0.46	0.59				
	GI 3M	20	0.41	0.45	-0.059	0.388	0.702	NS
	GI 6M	20	0.46	0.59				
Hearing impaired	GI BL	20	0.59	0.31	0.191	1.992	0.061	NS
	GI 3M	20	0.39	0.39				
	GI BL	20	0.59	0.31	0.143	0.998	0.331	NS
	GI 6M	20	0.44	0.48				
	GI 3M	20	0.39	0.39	-0.048	-0.315	0.756	NS
	GI 6M	20	0.44	0.48				

## Discussion

One of the common health problems associated among children with special health care needs are oral diseases and they are often neglected. When compared to the general population the prevalence and severity of oral diseases are very high in this group [10]. In the life of healthy children as well as children with special health care needs (CSHCN) oral diseases such as caries, periodontal diseases etc. can have negative impacts in their life [11]. The oral health of CSHCN may be affected by difficulty in understanding on the importance of oral health maintenance [12], communication difficulties [13], the use of anticonvulsant medications that has a great impact on their gingival health [14] and a fear of treatment procedures [15]. As all other habits of hygiene, tooth brushing habit is obtained throughout the socialization activity of a child. It will be naturally established in a child, if this habit is educated in early childhood. Vangipuram *et al.* 2016 [16] stated that school-based education has been shown effective in improving the oral health status of children in developing countries by providing them with accurate information and habits. Esan *et al.* (2015) [17], Joybell *et al.* (2015) [18], McCauley *et al.* (1955) [19], Patil *et al.* (2014) [20] reported that training in the classroom provides significant improvements in oral care, increasing the habit of brushing twice daily with the use of toothpaste containing fluoride. This study is only restricted to only special children and not on other children, as they faced a lot of difficulties while communicating and they can hardly understand what is said to them. Their oral health is often neglected because of other health issues by the parents and the care takers. We have taken the age group of 6-14 years because during this age period eruption of permanent teeth takes place in the oral cavity and if a proper oral health hygiene maintenance practice is trained through repeated learning during this time period then several oral diseases can be prevented and they

can maintained their oral health until adulthood. Joshi N *et al.* (2013) [21] stated that children in the mixed dentition stage are susceptible to poor oral hygiene because of carefree age, emotional stresses, increased frequency of refined sugar intake, soft and sticky food, shedding of deciduous, and eruption of permanent teeth. The reason for maintaining half of the children at the baseline level zero is to get a clear cut image of their tooth-brushing effectiveness by comparing with the other half. In our study, the plaque and gingival index of children who have undergone oral prophylaxis increases in all the four groups at the end of 3 months while there is reduction in cerebral palsy and hearing impaired children at the end of 6 months. Sandeep V. *et al.* [22] Doichinova L, Peneva M [23], Pareek S. *et al.* [24] reported that children with hearing impaired instill good oral hygiene when visual instruction is given to them. Most of the studies for oral hygiene improvement for H.I. children showed vast improvement. Bozkurt F.Y. *et al.* [25] stated that there is significant improvement in plaque levels and gingival health of C.P. children whereas Rai T. *et al.* [26] contradicted to our study that in individuals with cerebral palsy the efficiency of maintaining oral hygiene and gingival health increased only with custom-made tooth brushes. The plaque index for the children whose oral prophylaxis were not done, increases at 3 months in all except for H.I. and slight reduction in C.P. at the end of 6 months interval while the rest of them increases. The gingival index in all the group decreases at 3 months and 6 months time duration and only slight increase is seen in H.I. at 6 months. Smutkeeree A. *et al.* [27] as in our study reported that there was no statistically significant reduction in the plaque index in Autistic children while Abdallah E.A. *et al.* [28], Pilebro C *et al.* [29] in contradiction to our study stated by educational and preventive program on Autistic children visible plaque was reduced and was effective in improving the various caries risk factors. Sabbarwal P, Puranik M.P, Uma

S.R (2018) <sup>[30]</sup> reported that Down Syndrome children had awareness and positive attitude toward dental treatment but barriers such as presence of medical conditions, cost and dentist-related factors prevailed in children with DS. Hence, individuals with DS had poor oral health and limited access to dental care whereas Shyama M *et al.* <sup>[31]</sup> contradicted to our study that there was reduction in plaque and gingival scores after supervised tooth brushing in children with Down's syndrome.

"An intelligence quotient (IQ) is a total score derived from a set of standardized tests or subtests designed to assess human intelligence" <sup>[32]</sup>. The Intelligence Quotient (IQ) score of Cerebral palsy, Down's syndrome and Autistic children are affected i.e. they have low IQ as compared to the normal individuals and this explains that these children have difficulty in understanding and they need time to understand whereas in those children with hearing impairment, their IQ level is not affected. So, children with hearing impairment can respond normally to the environment. Thus, in this group the plaque index of hearing impairment children decreases and they can respond the tooth brushing instructions given to them.

In the present study, in spite of giving proper oral hygiene instructions the plaque index of these children are not improved except for that of the hearing impaired. However, children with Cerebral palsy, Down's syndrome and Autism have poor oral health condition due to poor motor ability, lack of understanding and negligence of the parents and caretakers despite of giving the oral hygiene instructions. This reinforces that professional oral prophylaxis should be done every three to six months interval of time. In order to overcome the barriers in the communication special teachers are needed as well as the cooperation of the caretakers. Overall there is improvement in the Gingival index. This indicates that an effective way of tooth brushing can improve the gingival health of a child. Oral health education will benefit these children. With rising number of people with special needs, the oral health fraternity should actively involve to bring about general and social well being and benefit them with sustained lifetime oral health.

### Conclusion

In this study, Plaque index may not show improvement due to lack of co-operation, movement limitations and their difficulty to perceived but there is a great reduction in Gingival index overall. An effective method of tooth brushing brought a good improvement in the gingival index. School based dental programs for oral health education should be done regularly and frequently as it will help in avoiding the expensive and lengthy dental procedures. Diet counselling, regular dental check-ups and oral prophylaxis programs should also be provided regularly to these children.

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### References

1. American Academy of Pediatric Dentistry. Definition of special health care needs. *Pediatr Dent* 2016;38:16.
2. Lindhe J, Axelsson P, Tollskog G. Effect of proper oral hygiene on gingivitis and dental caries in Swedish schoolchildren. *Community Dent Oral Epidemiol* 1975;3:150-5.
3. Baykan Z. Causes and prevention of disabilities, handicaps, and defects. *J Cont Med Educ* 2003;9:336-8.
4. Whiteford HA, Degenhardt L, Rehm J, Baxter AJ, Ferrari

AJ, Erskine HE. Global burden of disease attributable to mental and substance use disorders: Findings from the Global Burden of Disease Study 2010. *Lancet* 2013;382:1575-86.

5. Hughes MJ, Gazmararian JA. The relationship between income and oral health among people with intellectual disabilities: A global perspective. *Spec Care Dentist* 2015.
6. Pinkham JR. Oral hygiene in children: relationship to age and brushing time. *J Prev Dent* 1975;2(2):28-31.
7. O'Leary T. Emphasis: Current approaches to prevention control. *J Am Dent Assoc* 1984;109:690-702.
8. Tsamtsouris A, White GE, Clark ER. The effect of instruction and supervised toothbrushing on the reduction of dental plaque in kindergarten children. *J Dent Children* 1979;36:204-209.
9. Stutcliffe P, Wishart W.A, Naomi C. Supervised toothbrushing in a nursery school. *Brit Dent J* 1977;147:192-194.
10. H. Caring for a vulnerable population: Who will take responsibility for those getting a raw deal from the health care system? *Med J Aust* 1996;164:159-160.
11. Sheiham A. Dental caries affects body weight, growth and quality of life in pre- school children. *J Br Dent* 2006;25(10):625-6.
12. Shapira J, Efrat J, Berkey D, Mann J. Dental health profile of a population with mental retardation in Israel. *Spec Care Dentist* 1998;18:149-55.
13. Dunning JM. Principles of Dental Public Health. Cambridge: Harvard University Press 1986.
14. Stabholz A, Mann J, Sela M, Schurr D, Steinberg D, Shapira J. Caries experience, periodontal treatment needs, salivary pH, and *Streptococcus mutans* counts in a preadolescent down syndrome population. *Spec Care Dentist* 1991;11:203-8.
15. Casamassimo PS, Seale NS, Ruehs K. General dentists' perceptions of educational and treatment issues affecting access to care for children with special health care needs. *J Dent Educ.* 2004;68:23-8.
16. Vangipuram S, Jha A, Bashyam M. Effectiveness of peer group and conventional method (dentist) of oral health education programme among 12-15 year old school children- A randomized controlled trial. *J Clin Diagn Res* 2016;10:125-129.
17. Esan A, Folayan MO, Egbetade GO, Oyedele TA. Effect of a school-based oral health education programme on use of recommended oral self-care for reducing the risk of caries by children in Nigeria. *Int J Paediatr Dent* 2015;25:282-290.
18. Joybell C, Krishnan R, Kumar S. Comparison of two brushing methods- Fone's vs modified Bass method in visually impaired children using the Audio Tactile Performance (ATP) Technique. *J Clin Diagn Res* 2015;9:19-22.
19. Mc Cauley HB, Davis LB, Frazier TM. Effect on oral cleanliness produced by dental health instruction and brushing the teeth in the classroom. *J. Sch Health* 1955;25:250-254.
20. Patil SP, Patil PB, Kashetty MV. Effectiveness of different tooth brushing techniques on the removal of dental plaque in 6-8 years old children of Gulbarga. *J Int Soc Prev Community Dent* 2014;4:113-116.
21. Joshi N, Sujana S, Joshi K, Parekh H, Dave B. Prevalence, severity and related factors of dental caries in school going children of Vadodara city – An epidemiological

- study. *J Int Oral Health* 2013;5:35-9.
22. Sandeep V, Vinay C, Madhuri V, Rao VV, Uloopi KS, Sekhar RC. Impact of visual instruction on oral hygiene status of children with hearing impairment. *Journal of Indian Society of Pedodontics and Preventive Dentistry* 2014;32(1):39-43.
  23. Liliya Doichinova, Milena Peneva. Motivational training programme for oral hygiene of deaf children. *International Journal for science and research* 2015;4(2):1124-16.
  24. Sonia Pareek, Anup Nagaraj, Asif Yousuf, Shravani Ganta, Mansi Atri, Kushpal Singh. Effectiveness of supervised oral health maintenance in hearing impaired and mute children- A parallel randomized controlled trial. *Journal of International Society of Preventive and Community Dentistry* 2015;5(3):176-182.
  25. Bozkurt FY, Fentoglu O, Yetkin Z. The comparison of various oral hygiene strategies in neuromuscularly disabled individuals. *J Contemp Dent Pract* 2004;5:23-31.
  26. Rai T. Evaluation of the effectiveness of a custom-made toothbrush in maintaining oral hygiene and gingival health in cerebral palsy patients. *Special care in dentistry* 2018;38(6).
  27. Smutkeeree A, Khrautio T, Thamseupsilp S, Srimaneekarn N, Rirattanapong P, Wanpen W. The effectiveness of visual pedagogy for toothbrushing in children with Autism Spectrum Disorder. *Journal of International Society of Preventive and Community Dentistry* 2020;10(4):415-423.
  28. AbdAllah EA, Metwalli NE, Badran AS. Effectiveness of a one year oral health educational and preventive program in improving oral health knowledge and oral hygiene practices of a group of Autistic Egyptian children and their caregivers. *Future Dental Journal* 2018;4:23-29.
  29. Pilebro C, Backman B. Teaching oral hygiene to children with autism. *International Journal of Paediatric Dentistry* 2005;15(1):1-9.
  30. Bhavna Sabbarwal, Manjunath Puranik P, Uma SR. Oral health status and barriers to utilization of services among Down syndrome children in Bengaluru City: A cross-sectional, comparative study. *Journal of Indian Association of Public Health Dentistry* 2018;16(1):4-10.
  31. Shyama M, Mutawa SA, Honkala S, Honkala E. Supervised toothbrushing and oral health education program in Kuwait for children and young adults with Down syndrome. *Spec Care Dentistry* 2003;23(3):94-9.
  32. Braaten Ellen B, Norman Dennis. Intelligence (IQ) Testing. *Pediatrics in Review* 2006;27(11):403-408.