

Oral Health Status of Hearing and Speech Impaired Children Using OHAT and CAT: A Cross-Sectional Survey

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ABSTRACT

Background: Children with hearing disability can neither hear well even with a hearing aid nor understand speech without specific instructions. Such children have difficulty in living their normal life and demands for healthy life. Aim: To assess the oral health in Children with Hearing and Speech Impairment (HSI) using Oral Health status Assessment Tool and Caries Assessment Tool in Vadodara city.

Methodology: A cross-sectional institutional survey was implicated among the speech and hearing impaired children who attended special school in Vadodara city. A total 174 speech and hearing impaired children were selected as per the inclusion criteria. Prior written permission and consent was obtained from the participant's parents. The oral hygiene practices of deaf and dumb children were recorded through a sign language by teachers. Oral Hygiene Assessment Tool and Caries Assessment Tool were recorded by the principal investigator.

Result: Sixty seven percent had gingival inflammation and 59.8% had normal tongue. 55.2% had 1-3 decayed or broken teeth, 16.1% had unhealthy natural teeth. 78.7% of HSI children had change in oral hygiene. According to Caries Assessment Tool, 63.2% were in high caries risk group, 20.7% in low caries risk group and 16.1% in moderate caries risk group.

Conclusion: Oral health status of HSI child showed high risk caries with CAT and poor oral health status with gingivitis according to OHAT.

Keywords: Auditory impairment, oral health, OHAT, CAT.

INTRODUCTION

Normal life lies on coordination of physical and mental health coupled with an ideal social environment, but sometimes abnormality do occur in some individuals, and this needs careful assessment. In almost any community, there must be a few individuals suffering from handicaps of varying nature. It is desirable to safeguard of all children for good oral hygiene from their childhood. Education regarding oral health should be given to

both normal and handicapped children, and occupational and speech therapy to the later.¹

Oral health plays a key role in maintaining overall health; oral cavity plays a vital role in the life of human beings, through functions like esthetics, mastication, phonetics, communication and

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emotional expressions. If good oral health is not maintained, it will lead to various dental diseases like dental caries, periodontal diseases which adversely affects the overall health.²

Most of handicapped children start their life with healthy teeth and gums. But, their diet, eating pattern, limited physical dexterity, lack of good oral hygiene and attitudes of parents and care provider may contribute to poor oral health.²In recent years, very little attention has been paid to the dental health of the handicapped children, who actually require special care and attention. These people cannot maintain good oral hygiene and dental health as they are handicapped.³

Hearing impairment is a sensory type of impairment where the child can neither hear well (even with a hearing aid) nor understand speech without specific instructions. There are two types of hearing loss: congenital and acquired (caused by diseases).⁴Such children cannot adapt to current life demands with normal wellbeing of health.

HSI children are not differing from the normal children. Their life style has to be adjusted according to their capabilities. The diseases in general and oral diseases in particular in handicapped are no way different from normal children.⁵ Though a normal child gets the benefit of love and care from parents and the society, sensory impaired child is neglected by the society.⁶

The Oral Health Assessment Tool (OHAT) can help the caregiver in screening the oral health status of special children.⁷It also helps to check the oral hygiene care interventions. This acts as a trigger to call a dentist when required, to assist the child's individualized oral hygiene care planning which helps to overcome their dental needs.⁸

The objective of Caries Assessment Tool (CAT) is intended to educate healthcare worker to assess the caries risk in pediatric population which can aid in clinical decision for diagnostic, fluoride, dietary, and restorative protocols. The pediatric dentist may justify a change of the patient's risk level based on review of Caries Assessment Tool.⁹

Since these HSI children live in special schools, knowing their problems regarding dental diseases, it is easy to plan OHAT and CAT for such groups in school campus. This also gives the caretaker to

know the importance of dental health and care of special children.

MATERIALS AND METHODS

A cross-sectional survey was done to assess the oral hygiene status among the HSI children attending special school (MA KAMLABA MUKBADHIR VIDHYALAY) in Vadodara city. Ethical approval was obtained from ethical committee of Sumandeep Vidyapeeth (SVIEC/ON/DENT/SRP/15195). The prior written permission was also taken from the respective school for this survey.

A total 174 HSI children were selected as per the inclusion criteria. Prior written informed consent was obtained from the participant's parents. The purpose of this study was informed and explained to the children and caregiver. However for deaf and dumb children, help of teachers were taken to explain the purpose of study.

The general information regarding name, age and oral hygiene practices were recorded with the help of respective class teachers who were used as co-coordinators for the study. The oral hygiene practices of deaf and dumb children were recorded through a sign language by teachers. The oral examination was done for all the participants. Oral Hygiene Assessment Tool (OHAT) and Caries Assessment Tool (CAT) were used to assess the oral hygiene status which was recorded by the principal investigator.

OHAT consists of categories like lips, tongue, gums, saliva, natural teeth, oral cleanliness and dental pain which have to be checked in healthy, changes and unhealthy criteria. CAT has been taken from ADA (American Dental Association) for above 6 years of age. CAT consists of categories like contributing, general and clinical conditions which has to be checked in mild, moderate and high caries risk group. The descriptive statistical analysis was done with the different test like One way ANOVA, Tukey's HSD Post Hoc Test for multiple comparisons, Fisher's Exact Test, Pearson Chi-Square, Independent T-Test.

RESULTS

In this cross-sectional survey, total 174 HSI children were screened using OHAT and CAT among them 58% were male and 42%female HSI children. Out of

Table 1: Oral Health Assessment Tool used in Hearing and speech impairment children.

HARD AND SOFT TISSUE	HEALTHY		CHANGES		UNHEALTHY	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
LIPS	78	44.8	88	50.6	8	4.6
TONGUE	104	59.8	69	39.7	1	.6
GUMS	45	25.9	116	66.7	13	7.5
SALIVA	122	70.1	51	29.3	1	.6
NATURAL TEEH Y/N	50	28.7	96	55.2	28	16.1
DENTURES Y/N	173	99.4	1	.6		
ORAL CLINLINESS	35	20.1	137	78.7	2	1.1
DENTAL PAIN	114	65.5	60	34.5		

Table 2: Caries Assessment Tool used in Hearing and speech impairment children.

Caries	Frequency	Percent
High Risk	110	63.2
Low Risk	36	20.7
Moderate Risk	28	16.1
Total	174	100.0

Table 3: Caries Assessment Tool used in Hearing and speech impairment children using one way ANOVA test for Natural Teeth.

Natural Teeth	N	Mean Total Score	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Low Risk	36	1.55	1.50	0.25	1.04	2.06	0.00	5.00
Moderate Risk	28	3.60	1.13	0.21	3.16	4.04	1.00	6.00
High Risk	110	5.15	2.10	0.20	4.75	5.55	1.00	12.00
Total	174	4.16	2.35	0.17	3.80	4.51	0.00	12.00

Table 4: Comparison of Natural teeth of OHAT with Dental caries of CAT.

		Caries			Total
		Low Risk	Moderate Risk	High Risk	
NATURAL TEETH Y/N	Healthy	35	12	3	50
		70.0%	24.0%	6.0%	100.0%
	Changes	1	15	80	96
		1.0%	15.6%	83.3%	100.0%
	Unhealthy	0	1	27	28
		.0%	3.6%	96.4%	100.0%
Total		36	28	110	174
		20.7%	16.1%	63.2%	100.0%

174 HSI children, mean age of children was 11.16 ± 1.98 . The range was from 7 to 14 years. Out of 174 Hearing and Speech Impairment children, mean was 4.16 ± 2.35 which ranged from 0 to 12 as per the OHAT.

Table 1 shows the lip, tongue, gums, saliva, natural teeth, oral cleanliness, and dental pain changes in hearing and speech impaired children. 44.8% HSI children had healthy lips, 50.6% had dry or red color lips, and 4.6% had unhealthy and swollen lips.

In relation to tongue, out of 174 Hearing and Speech Impairment children, 59.8% had healthy pink, moist tongue, 39.7% had patchy, fissured, red coated tongue and 0.6% had red and/or white, ulcerated, swollen tongue. In relation to gums, 25.9% HIS children had pink, moist, smooth gums, 66.7% had dry, shiny, rough, red, swollen gums and 7.5% had swollen, bleeding gums.

In relation to saliva, 70.1% HSI children had watery and free-flowing saliva, 29.3% had dry, little saliva and 0.6% had very thick little/no saliva. In relation to natural teeth, 28.7% Hearing and Speech Impairment children had no decayed or broken teeth/roots, 55.2% had 1-3 decayed or broken teeth/roots and 16.1% had 4 or more decayed or broken teeth. In relation to denture, none of the Hearing and Speech Impairment child wore a denture.

In relation to oral cleanliness, out of 174 screened Hearing and Speech Impairment children, 20.1% had clean, no food particles in mouth, 78.7% had food particles/tartar/plaque in 1-2 areas of the mouth or bad breath and 1.1% had severe halitosis (bad breath). In relation to dental pain, 65.5% HIS children no signs of dental pain, 34.5% had verbal signs of pain such as pulling at face, chewing lips, not eating, aggression.

Table 2 shows the results of Caries Assessment Tool (CAT) for 174 screened Hearing and Speech Impairment children out of which, 63.2% were in high caries risk group, 20.7% low caries risk group and 16.1% in moderate caries risk group.

Table 3 shows inter group relation of low risk CAT in 36 children with 1.55 ± 1.50 with 95% confident interval 1.04 to 2.06. The Moderate risk CAT in 28 children with 3.60 ± 1.13 with 95% confident interval 3.16 to 4.04. The High risk CAT in 110

children with 5.15 ± 2.10 with 95% confident interval 4.75 to 5.55. It is appreciable to increase mean total score as well as Std. Error that is from 1.55 to 5.15 and from 1.50 to 2.10 respectively by one way ANOVA statistical test and P value is significant (<0.001). Tukey's HSD POST HOC test for multiple comparison shows high difference between low risk to high caries risk and that is -3.59 (<0.001).

Caries Assessment Tool in Hearing and speech impaired children using one way ANOVA for age inter group relation of 7-9 years old children were 41 with 3.26 ± 2.45 with 95% confident interval 2.49 to 4.04. The 10-12 years old children were 84 with 4.90 ± 2.43 with 95% confident interval 4.37 to 5.43. The 13-14 years old children were 49 with 3.63 ± 1.66 with 95% confident interval 3.15 to 4.11. In relation to different age group, it is not appreciable to increase mean total score as well as Std. Error that is from 3.26 to 3.63 and from 2.45 to 1.66 respectively by one way ANOVA statistical test. P value is not significant (<0.001).

Caries Assessment Tool used in Hearing and speech impairment children showing intra group comparison with the help of Tukey's HSD POST HOC test for multiple comparisons showed high difference 7-9 year to 13-14 year of group (<0.001).

Table 4 shows that 50 HSI children had healthy natural teeth, among which 6.0% were at high caries risk, 24% were at moderate caries risk, 70% were at low caries risk. 96 children had change in natural teeth, among which 83.3% were at high caries risk, 15.6% were at moderate caries risk, 1.0% were at low caries risk, while 28 children had unhealthy natural teeth, among which 96.4% were at high caries risk, 3.6% were at moderate caries risk, 0% were at low caries risk. So, significant relation was found between natural teeth and caries. According to Fisher's Exact Test P value was significant between natural teeth and caries experience (<0.001).

Table 5 shows the relation between gender and caries, among 174 HIS children, 73 were female with 61.1% at high caries risk, 20.5% at moderate risk and 17.8% at low risk. While 101 were male, from which 64.4% were at high caries risk, 12.9% were at moderate risk and 22.8% were at low risk. No significant difference was found between the sex

and caries. According to Pearson Chi-Square P value was not significant in between the sex and caries experience (< 0.001).

DISCUSSION

The disabled children form a considerable section of the community, and it is estimated that there are about 500 million people with disabilities worldwide¹⁰ and they are on the increase in proportion to the general population.¹¹ The AHA defines a child with disability as a child who for various reasons cannot fully make use of all his or her physical, mental and social abilities.¹² Patients with disabilities consist of a unique population deserving special consideration.¹³

Till now JM Chalmers et al⁸ and Sanjay V et al¹³ had conducted the studies to determine the oral health status and dental caries prevalence of handicapped children in India. Therefore the current study was conducted to find out nature and severity of dental as well as oral health problems among Hearing and speech impaired child so that measures can be taken accordingly.

Hearing impairment is often associated with speech disorders.¹⁴ A dentist who is dealing with a child with hearing and speech impairment must change normal therapeutic approach and involve parents or caretaker during examination. Also, interventions must be implemented carefully because it is a child with special needs and requirements.¹⁵

The world wide estimated disabilities are 500 million people. Census 2016 reported that in India 21 million people are suffering from one or the other kind of disability, which is equivalent to 2.1% of the Indian population. Among them 12.6 million are males and 9.3 million are females.¹⁶ Among them, in speech (7.5%), and in hearing (5.8%) respectively.

Kayser-Jones¹⁷ who developed the BOHSE recommended for use in Australian Aged Care, considerable peer, professional and industry input was considered in a pilot study which resulted in the development of a modified version of the BOHSE, termed the OHAT in this study. Such methodology enabled the simplification of the assessment tool, whilst maintaining the integrity, validity and indeed improving the reliability of the

original BOHSE. It was important to assure that the OHAT was able to be used by all staff ranging from Personal Care Attendants to Registered Nurses.^{18, 8} In the initial BOHSE study nurses found the tongue examination with gauze and light 'challenging', as was the use of the tongue blade – thus their use was not continued in the OHAT study.⁸ so, in this study we have used OHAT for oral health assessment in HSI children.

According to Dirks B et al¹⁹ the children with immigrant backgrounds have three times higher caries rates than non-immigrants. Singh KA et al²⁰ saw an inverse relationship between socioeconomic status and caries prevalence. In this study according to OHAT, 28.7% had healthy natural teeth, 55.2% natural teeth with 1-3 decay or broken teeth, 16.1% had 4 or more decayed teeth in HSI children.

Avasthi K et al²¹ found the mean DMFT in the deaf/mute is 3.18. The status of gingival health was determined using the gingival index which was at 49.65%. The prevalence of dental caries was more in the deaf/mute children. The similar results were found in the present study.

According to Berkey DB et al,²² further research should be initiated with OHAT tools which needs to focus on improvement in the categories of saliva, oral cleanliness and dental pain. As similar issues have arisen in the use of oral assessment screening tools in other acute and rehabilitative care settings, future research could reflect on the challenges in speech and hearing impaired children.⁸ In this study we assessed and checked the status of saliva, oral cleanliness, and dental pain, and result were found that 70.1% had moist tissues with watery and free-flowing saliva, 29.3% had dry, little saliva, 0.6% had saliva very thick, 20.1% had healthy oral hygiene that is no food particles in mouth, 78.7% had change in oral hygiene that is food particles in 1-2 areas of the mouth (bad breath), 1.1% had severe halitosis.

Bimstein²³ in 2014 showed 63% of plaque and 60% gingival in auditory children who had deficient knowledge on how to prevent dental caries and periodontal diseases.

Caries assessment tool assist dental practitioners, physicians, and other non-dental health care providers in assessing levels of risk for caries

development in infants, children, and adolescents. As new evidence would emerge, these tools can be re-fined to provide greater predictability of caries in children prior to disease initiation.⁹

Caries-risk assessment models currently involve a combination of factors including diet, fluoride exposure, a susceptible host, and microflora that interplay with a variety of social, cultural, and behavioral factors.⁸ With the ability to detect caries in its earliest stages (ie, white spot lesions), health care providers can help prevent cavitation.²⁴ In this study according to Caries Assessment Tool (CAT), 63.2% were in high caries risk group, 20.7% in low caries risk group and 16.1% in moderate caries risk group.

Jain et al.¹⁰ revealed that children with hearing and speech impairment that attend special schools had poor oral hygiene and increased need for dental treatment. The mean DMFT in these children was 2.61. Djeri A et al²⁵ showed the average DMFT value of the total sample was 7.79 (SD 4.87). Male respondents had higher DMFT index (8.50) than female (6.93), but the difference was not statistically significant (p=0.19). In the present study there was no significant difference found between the gender and dental caries.

Adequate prevention programs for the auditory impaired may include: removing masks while talking; reducing background noise; learning to use simple signs; using an interpreter when needed; increasing the oral health awareness of the child and their caretakers (parents and/or teachers); and frequent oral health reinforcements to evaluate how well the dental hygiene instructions were received and how well they are being implemented.

CONCLUSION

The OHAT was evaluated as being a reliable and valid screening assessment tool for use in residential care facilities, including those with cognitively impaired residents. Paediatric patients with special needs would require oral assessment screening tools in all settings to investigate oral health categories. 66.7% of speech and hearing impaired children had gingival inflammation with 78.7% had halitosis where as Caries Assessment Tool showed 63.2% in high caries risk group. The OHAT and CAT should be done at 6 months interval

by caregiver for betterment of oral health status and it should be mandatory in HSI children.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

REFERENCES

1. Kamatchi JKR, Joseph J, Krishnan ACG. Oral hygiene and periodontal status in a group of institutionalized hearing impaired individuals in Pondicherry-A Descriptive study. J Indian Assoc Public Health Dent 2002; 12-14.
2. Shivakumar M. Dental care delivery to the institutionalized handicapped children. J Indian Assoc Public Health Dent 2002; 6-7.
3. Rawlani SM, Girish Gupta, Manish Thadani. Prevalence of dental caries in physically challenged children. J Ind Dent Assoc 2001; May 72: 154-155.
4. Davis H, Silverman SR. Hearing and Deafness. New York, Holt: Rinehart and Winston Inc; 1960.
5. Kamatchy KRJ, Joseph J, Krishnan ACG. Dental caries prevalence and experience among the group of institutionalized hearing impaired individuals in Pondicherry-A Descriptive study. Indian J Dent Res. 2003; 14(1): 29-32.
6. Nagaraja Rao G. Oral health status of certified school children of Mysore State -A Report. J Ind Dent Assoc 1985 Feb 57: 61-64.
7. Varma RK. Preventive measures in handicapped children. J Ind Dent Assoc 1981; 53:173-174.
8. JM Chalmers, PL King, AJ Spencer, FAC Wright, KD Carter. The Oral Health Assessment Tool – Validity and reliability. Aust Dent J 2005;50(3):191-199.
9. AAPD Guideline on Caries-risk Assessment and Management for Infants, Children, and Adolescents. Reference manual 2016;36(6): 127-34.
10. Jain M, Mathur A, Kumar S, Dagli RJ, Duraiswamy P, Kulkarni S. Dentition status and

- treatment needs among children with impaired hearing attending a special school for the deaf and mute in Udaipur. India. *J Oral Sci* 2008;50(2):161-5.
11. Chi N, Yang K. A study on the dental disease of the handicapped. *J Dent Child* 2003;70:153-8.
 12. Altun C, Guven G, Akgun OM, Akkurt MD, Basak F, Akbulut E. Oral health status of disabled individuals attending special schools. *Eur J Dent* 2010;4(4):361-6.
 13. Sanjay V, Shetty SM, Shetty RG, Managoli NA, Gugawad SC, Hitesh D. Dental health status among sensory impaired and blind institutionalized children aged 6 to 20 years. *J Int Oral Health* 2014; 6(1):55-58.
 14. Keilmann A, Kluesener P, Freude C, Schramm B. Manifestation of speech and language disorders with hearing impairment compared with children with specific language disorders. *Logoped Phoniatr Vocol*. 2011; 36:12-20.
 15. Singh RK, Murawat K, Agrawal R. Dental care for deaf pediatric patient. *Indian J Otol*. 2012; 18:171-3
 16. http://censusindia.gov.in/Census_And_You/disabled_population.aspx
 17. Kayser-Jones J, Bird WF, Paul SM, Long L, Schell ES. An instrument to assess the oral health status of nursing home residents. *Gerontologist* 1995;35:814-824.
 18. Fiske J, Griffiths J, Jamieson R, Manger D. Guidelines for oral health care for long-stay patients and residents. Report of BSDH Working Group. Revised, January, 2000. British Society for Disability and Oral Health.
 19. Backer Dirks O, Houwink B, Kwant GW. The results of 6 years of artificial fluoridation of drinking water in The Netherlands – The Tiel Cumentborg experiment. *Arch Oral Biol* 1961;5(12):284-300.
 20. Singh KA, Spencer AJ, Armfield JM. Relative effects of pre- and post-eruption water fluoride on caries experience of permanent first molars. *J Pub Heath Dent* 2003;63(1):11-9.
 21. Avasthi K, Bansal K, Mittal M, Marwaha M. Oral health status of sensory impaired children in Delhi and Gurgaon. *Int J Dent Clin* 2011;3(2):21-23.
 22. Berkey DB, Ettinger RL, Meskin LH. Oral health care variables affecting the institutionalized and homebound individual: a review and analysis of the literature 1970–1989. Monograph Series, No. 3. Iowa Geriatric Education Center, 1990.
 23. Bimstein E, Jerrell R.G., Weaver J.P., Dailey L. Oral Characteristics of Children With Visual or Auditory Impairments. *Pediatr Dent* 2014; 36(4): 336-41.
 24. Ismail AI, Nainar SM, Sohn W. Children's first dental visit: Attitudes and practices of US pediatricians and family physicians. *Pediatr Dent* 2003;25(5):425-30.
 25. Djeri A, Radman IK, Grabež M, Bajić Z, Prtina A, Novaković B, Živković S. Oral Health in Children with Hearing and Speech Impairment in Banjaluka. *Serbin dental journal* 2013;60(3):139-46.