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Oral Health & Quality of Life in preadolescents with hearing impairment in Uttarakhand, India

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ABSTRACT

Background: "Better teeth better health" is a guiding dictum for the 21st century that has been well adopted by WHO and emulated world over by numerous health care agencies. Hence its of paramount importance to assess the impact of oral health on the quality of life. Keeping this in mind the present study was done to gauge the impact of prevalence of dental diseases amongst 9–15 year old institutionalized hearing impaired children in districts of Uttarakhand, India.

Materials & methodology: 250 hearing impaired institutionalized 9–15 year old children were examined using WHO type III clinical examination for DMFT/dmft, Traumatic dental injuries using TDI index and dentofacial anomalies using Angle's classification of malocclusion. The Hindi version of the C-OIDP questionnaire was used in this study.

Results: There was a high dental caries prevalence of 56% with significant male predilection. TDI index was 40.8% and the most common molar relation was class I with 90.4%. With 49.6% crowding was the most common dentofacial anomaly. Deformity of face or mouth has maximum impact on the daily life of these children. The overall oral health related quality of life was less favorable in this group.

Conclusion: Oral health has a significant impact on daily life of these children with hearing impairment and those children having dental diseases showed unfavorable OHRQoL.

Introduction

"Every tooth in a man's head is more valuable than a diamond" - Miguel de Cervantes.

Our oral health has an impact on our overall health both physical & psychological and neglecting one has a negative impact on the other. Dental treatment needs is one among those needs that requires special attention. However O'Donnell and Crosswaite have found that oral health care comes far down in the list of priorities in case of handicapped individuals. An explanation to this might be that the handicapping condition itself is of major concern and hence oral health may be neglected as suggested by O'Donnell.[1]

Dentistry has advanced by leaps & bounds; as a result of which for most of this century, dental health has been considered an important and integral part of general health services and has been delivered to individuals and groups in settings such as dental practice schools, the workplace and day-care and residential settings for older adults. The population as a whole has also been targeted using mass media campaigns. These efforts are testimony to dentistry's long-standing and, perhaps pioneering, concern with the prevention & management of oral diseases. However implementation of oral health services to these special children has remained a lip service. All the advances & development in oral health care sector is yet to trickle down to this forlorn section of the society.[2,3]

Very little published literature on dental health measures for the hearing impaired children is available. Most dental literature available is devoid of patient-centered, biopsychosocial approach to oral healthcare.[4]

Prevalence studies conducted so far have primarily laid emphasis on the dental conditions of these special group of individuals but they have not highlighted the impact of the prevailing dental problems on their quality of life.[5–8] This study would not only help to chart out a comprehensive & exclusive dental treatment plan for these children but also help in preventing the dental health problems.

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Studies like those conducted by Biesbrock AR, Walters PA & Bartizek RD in 2004[9] & Hugoson A, Lundgren D, Asklow B, Borgklint G in 2003[10] support the role of an educational program in promoting oral health in children without any disability. This has led to incorporation of various oral health care measures & policies by various countries & international organizations like WHO.[11]

Taking a cue from this the Indian government initiated a National Oral Health Care Programme in collaboration with Indian Dental Association in 1998. However, there have been no references on special oral health care measures for the hearing impaired individuals in this government aided initiative.[12] Frequent professional dental care is impossible to be availed by all of the individuals belonging to these special groups as its expensive. Also even though 25,000 dental professionals are churned out of 292 dental college in India every year, there is a dearth of exclusively trained oral health care professionals who could attend to the unmet dental need of the hearing impaired individuals.[13] So the oral health care needs of this special group remain unattended which takes a toll, on their general wellbeing.

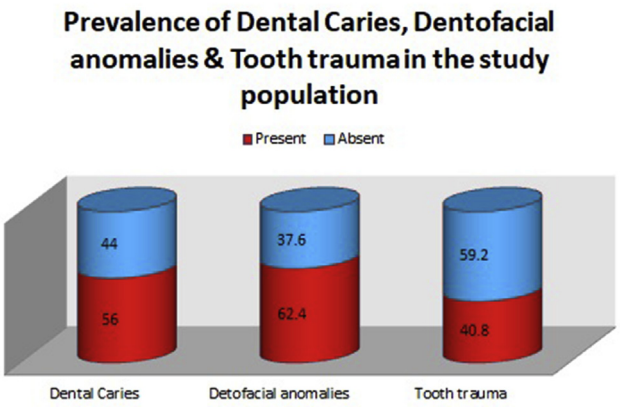
For a complete holistic approach the clinical indicators are now a days supplemented with health related quality of life indicators and C-OIDP is one such parameter that is used to gauge oral health related quality of life in children.[14]

The present study was thus initiated in order to close the current gap in knowledge regarding the repercussions of poor oral health conditions on quality of life of such differently abled children (i.e.loss of hearing) by assessing the association between Oral Health Related Quality Of Life, measured through Child-OIDP scale, demographic characteristics, self-reported oral problems and clinical oral health measures among 9–15 year old children with hearing loss in districts of Uttarakhand,India. It would not only help to chart out an exclusive & comprehensive dental treatment plan but also help in preventing dental problems in these differently abled children.

The study also aimed to provide a research agenda to support acceleration toward the Health Millennium Development Goals with respect to this neglected populations of children. This study is also first of its kind in this region.

Material & methodology

For this cross-sectional descriptive study a total of 22 registered Uttarakhand Government & non Government organizations were found to be working in the field of Education, Training, Employment and Rehabilitation of disabled children, the list of which was obtained from the official website of Sarva Shiksha Abhiyaan, Government. Of Uttarakhand. Of these only 2 schools (from north Garhwal & Kumaon divisions of Uttarakhand) fulfilled our criteria. A total of 250 hearing impaired children (legally hearing impaired i.e. “The one who has the hearing loss of 60 dB or more in the better ear for conversational range of frequencies”.)[15] aged 9–15 year old were examined for this study which was conducted over a span of nine months i. e February 2015 to October 2015. Ethical clearance was obtained from institutional ethical committee and permissions were taken from the concerned institutions were dental camps were conducted. The parents/wards of the children were also informed about the study and due consent was taken from them before conducting the study. Children who were uncooperative for clinical examination & those with any type of severe systemic diseases were excluded from the study. The children were given the Hindi version of C-OIDP forms[16] class wise & they themselves filled the forms. Then type III clinical examination was conducted by the pre calibrated principal investigator only(kappa co-efficient 0.85) with help of two house surgeons who were used as scribes. Dental caries, tooth trauma and dentofacial anomalies was gauged using DMFT/deft indices, TDI index and Angle's malocclusion classification. Overjet of more than 3 mm was taken as increased & less than that was considered as decreased; overbite was considered increased if more than 2 mm & decreased if less than 2 mm.Crowding was considered as present when



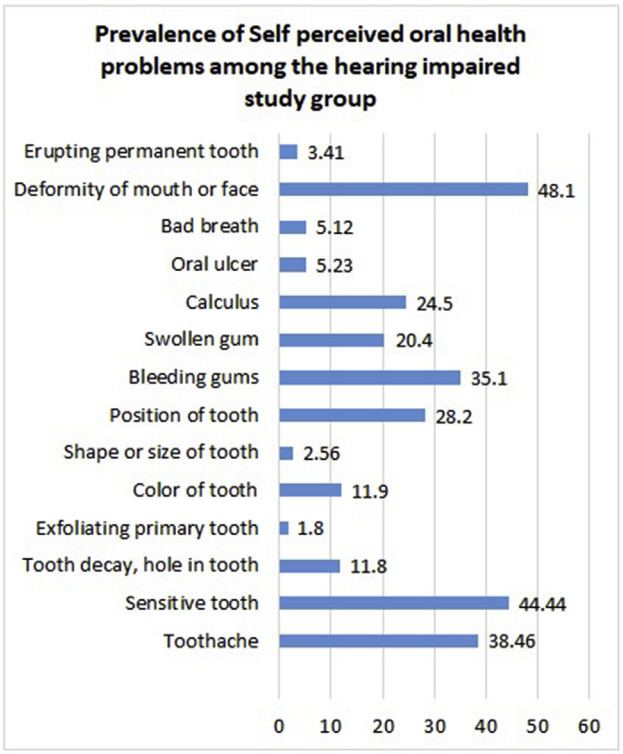
Graph 1. Prevalence of dental caries, dentofacial anomalies and tooth trauma in the study population.

there was overlapping of one or more teeth. Similarly crossbite was considered present if one or maxillary teeth were placed palatal or lingual to mandibular teeth.[17]

The collected data was subjected to The Excel and SPSS version 21.0 (SPSS Inc., Chicago, IL, USA) software packages. The collected data was analysed using Chi-square test and Pearson's co-relation co-efficient. Bivariate analysis was done between the independent variables viz. Socio-demographic and oral health indicators, and C-OIDP with odds ratio (OR) and 95% confidence interval (CI) (pre-determined).

Results

The study population comprised of children from 9 to 15 years old with mean age of 12.09 ± 2.46 having 54.4% males & 45.6% females. The mean DMFT was 1.66 ± 2.09& def was 1.70 ± 2.98 with significant male predilection. The prevalence of traumatic dental injuries was 40.8% and was confined to enamel & dentin only (graph 1). The hearing impaired children mainly demonstrated Angle's class I molar relation(90.4%) and crowding was the most common dentofacial anomaly recorded at 124(49.6%), followed by deep bite 16(6.4%), anterior open bite 12(4.8%), anterior crossbite 10(4%), posterior crossbite 16(1.6%),& posterior open bite 2(0.8%) with significant female predilection for anterior open bite and anterior crossbite. When *t*-test was applied the difference was statistically significant for all the dentofacial anomalies. The hearing impaired children considered facial deformity as most common oral health problem and missing teeth as least perceived oral health problem (graph 2). The overall severity of impact on daily activities was 26.9%. The hearing impaired children had maximum difficulty in cleaning & maintaining personal hygiene due to oral health problems while their studies were least affected due to oral health related problems. The overall frequency of impact on daily activities was 27.08% (Table 1). Among hearing impaired children, speaking is simultaneously affected along with auditory loss as a developmental defect or due to malfunctioning of vocal cords, hence this parameter could not be assessed in this group. Eating and study was found to be affected by toothache and teeth sensitivity and by ulcers and the exfoliation of deciduous teeth. Oral hygiene was impaired by ulcer, bleeding and swollen gums. Emotions were found to be affected by toothache, sensitivity, exfoliation and tooth position. Toothache, tooth position and tooth color affected smiling. Contact was also affected by toothache, tooth position and tooth color along with exfoliation of deciduous teeth. The C-OIDP impact showed highly significant positive correlation with age & significant negative correlation with DMFT. Age had a significant positive correlation with dentofacial anomalies. DMFT showed a strong positive correlation with dentofacial anomalies Dentofacial anomalies showed a significant strong positive correlation with TDI (Table 2). Bivariate analysis was run for C-OIDP



Graph 2. Prevalence of Self perceived oral health problems among the hearing impaired children.

Table 1
Prevalence of C-OIDP & frequency of Impacts on daily activities among the study groups.

FREQUENCY OF IMPACT	Quite a lot (3)	Pretty much (2)	Very little (1)	Total
Eating	5	8	79	92 (36.8%)
Speaking	–	–	–	–
Cleaning	0	27	79	106 (42.4%)
Sleeping	0	23	50	73 (29.2%)
Emotion	4	19	66	89 (35.6%)
Smiling	3	7	28	38 (15.2%)
Study	0	7	22	29 (11.6%)
Contact	0	7	40	47 (18.8%)

since it showed correlations with independent Sociodemographic variables & oral health indicators & the results are illustrated in Table 3. With age, C-OIDP impact had an odds of 2.82 with a statistical significant difference. C-OIDP had a significant odds of 1.13 ($p < 0.05$) with gender. C-OIDP impact had an odds of 0.64 with DMFT. Thus, all the parameters that were entered into the model showed a significant odds ratio for C-OIDP impact. The male participants tend to have higher COIDP scores as compared to females thus suggesting less favourable oral health related quality of life in males as compared to females. Participants > 12 years age had severe impact of poor oral health on their day to day activities as compared to those < 12 years of age. Children who presented with dentofacial deformities, dental caries & traumatic injuries reported higher COIDP scores suggestive of unfavourable oral health related quality of life.

Table 3
Bivariate analysis between the independent variables: socio-demographic and oral health indicators, and C-OIDP with odds ratio (OR) and 95% confidence interval (CI).

		C-OIDP Impact > 0 OR (95% CI)
Age	Under 12	1
	More Than 12 Years	**2.82** (2.06–3.89)*
Gender	Females	1
	Males	**1.13** (0.82–1.56)*
Caries Experience	Absent	1
	Present	**0.64** (0.47–0.88)*
Dentofacial Anomalies	Absent	1
	Present	**1.21** (0.87–1.67)*
Tdi	No Trauma	1
	Present	**0.93** (0.69–1.27)*

*p value < 0.05.

Discussion

The first objective of our study was to measure components of oral health status amongst the study groups through various indices. The second objective was to find out the impact of the oral health status if any, on quality of life of these children using Child-OIDP Index.

We have included age groups 9–15 year old because they are capable enough to correctly answer the questions of C-OIDP questionnaire.[18] Also despite the enormous psychosocial changes associated with childhood, French and Christie have shown that children begin to understand the effects of ill-health on social activities around 8 years of age.[19]

Our study was conducted in an institutionalized set up because schools are about maximizing the educational outcomes for students. Today schools and the education sector in general have begun to recognize these links and embrace the concept of a whole school approach in embracing health and social issues Studies in the last decade conducted by Lawerence St Leger have indicated the potential of "the health promoting school", that provides a promising strategic

Table 2
Correlations among socio-demographic, clinical variables and C-OIDP impact.

		Age	Gender	DMFT	Dentofacial anomalies	TDI	C-OIDP impact
Age	Pearson Correlation	1	-.013	-.036	.174[a]	-.008	.250[a]
	P value	–	.739	.349	.000	.832	.000
Gender	Pearson Correlation	-.013	1	-.061	.053	-.031	.029
	P value	.739	–	.113	.171	.420	.448
DMFT	Pearson Correlation	-.036	-.061	1	.127[a]	.076[b]	-.106[a]
	P value	.349	.113	–	.001	.048	.006
Dentofacial anomalies	Pearson Correlation	.174[a]	.053	.127[a]	1	.241[a]	.043
	P value	.000	.171	.001	–	.000	.266
TDI	Pearson Correlation	-.008	-.031	.076[b]	.241[a]	1	-.017
	P value	.832	.420	.048	.000	–	.665
C-OIDP impact	Pearson Correlation	.250[a]	.029	-.106[a]	.043	-.017	1
	P value	.000	.448	.006	.266	.665	–

[a] Correlation is significant at the 0.01 level (2-tailed).
[b] Correlation is significant at the 0.05 level (2-tailed).

framework which will enable the outcomes of health literacy to be achieved.[20]

St Leger and Nutbeam[20] had proposed that the health promoting school contributes to four main school related outcomes:

1. Lifelong learning skills.
2. Competencies and behaviors.
3. Specific cognate knowledge and skills.
4. Self attributes.

An oral health promoting school for the hearing impaired children would thus not only help them to learn favorable oral health practices but also master the skills for the same e.g. skills of tooth brushing, skills to choose an appropriate diet etc. So we targeted such schools in our study.

The exclusion criteria in our study were those children with any other physical or mental disabilities other than hearing impairment. This was because it would have hindered the comprehension of the C-OIDP questionnaire given to participants with multiple impairments and thus this could have had an influence on the results. Also the cognitive skills & communication capacities of mentally disabled children would have compromised the validity & reliability of the C-OIDP questionnaire so they were placed in the exclusion criterion.

The present study provides information on dental health status in a representative sample of (n = 250) hearing impaired school children from districts of Uttarakhand which means that results can be generalized for the hearing impaired children in Uttarakhand, India.

Dental caries was assessed using DMFT index given by Henry T Klein, Carrole E Palmer & Knutson J W in 1938 for permanent dentition[21] & deft index given by Gruebbel AO in 1944 for primary dentition[21] in order to:

1. To find the prevalence of dental caries in the hearing impaired children.
2. To collect data for future reference.

DMFT/deft index was used in our study as it has been considered as gold standard in oral epidemiological studies.[21]

The prevalence of dental caries in the present study was 56% in hearing impaired group with a significant male predilection. Mean DMFT was 1.66 in while mean deft was 1.70.

Dental malocclusions exhibit the third highest prevalence among oral pathologies. Although dental malocclusion is not a life-threatening condition, the psychosocial distress, impaired mastication and poor periodontal conditions associated with it, need to explore the prevalence of malocclusion in different ethnic groups. For the hearing impaired individuals, malocclusion makes the functions of oral cavity like eating, swallowing, speech and chewing difficult for them which further worsens their oral health adding to their co-morbidity[22]

So various dentofacial anomalies were estimated in the given population using Angle's malocclusion classification.& criterion used in several other studies done to estimate dentofacial anomalies in general population like those conducted by H. Kaur, U. S. Pavithra, and R. Abraham in south india.[17]

The sample group showed highest prevalence of class I molar relation ie 90.4% followed by Angle's Class II at 6.4% & finally class III which was seen in 3.2% hearing impaired children. Crowding was most commonly seen dentofacial anomaly at 49.6%. This was followed by deep bite, anterior openbite, anterior crossbite, posterior crossbite, and posterior openbite.

Of all the dentofacial anomalies there was a significant female predilection in anterior openbite & anterior crossbite amongst hearing impaired individuals. This could be because of the fact that vertical facial proportions are more genetically controlled and most frequent inherited malocclusion is open bite Also mandibular shape is more genetically determined than the mandibular size.[23,24]

Traumatic dental injuries are a neglected oral condition despite its relatively high prevalence, significant impact on individuals & society, & sound body of knowledge about its causative factors & treatment. In addition, the remarkable decline of the prevalence & severity of dental caries amongst children in many countries has made traumatic dental injuries as second most common dental problem after dental caries worldwide.[25]

According to Andreasen children with sensory impairment are at higher risk for dental trauma.[25] So dental trauma was assessed in this population with help of Traumatic Dental Injury Index based on WHO International classification of diseases to dentistry & Stomatology.[25]

This index has been adopted by WHO for screening of traumatic dental injuries in epidemiological studies worldwide & it also helps in estimation of treated injuries which helps to understand the degree of awareness & dental facilities availability for the study population. Also a TDI score can be obtained clinically without using radiographs & it helps to understand the severity of the disease in the study population. Thus it was used in our study to gauge traumatic dental injuries.[25]

The most commonly perceived oral health problem amongst hearing impaired children was deformity of face or mouth. The overall severity of impact on daily activities was 26.9% in hearing impaired group. The overall frequency of impact on daily activities in hearing impaired children was 27.08%.

The male participants tend to have higher COIDP scores as compared to females thus suggesting less favorable oral health related quality of life in males as compared to females. Participants > 12 years age had severe impact of poor oral health on their day to day activities as compared to those < 12 years of age. Children who presented with dentofacial deformities, dental caries & traumatic injuries reported higher COIDP scores suggestive of unfavorable oral health related quality of life.

So far the C-OIDP questionnaire has not been delivered to hearing impaired children anywhere in the world & no study has been reported on the prevalence of dental caries, tooth trauma & dentofacial anomalies among 9–15 year old hearing impaired school children in districts of Uttarakhand & measurement of its impact on their day to day activities; therefore the data collected in this study may be used for comparison for further similar studies.

Based on the findings of our study following suggestions are recommended to intercept & prevent dental diseases in hearing impaired children:

- Provision of oral health education in special schools, including proper instructions on oral hygiene
- Parent/guardian counseling
- Ministry of Health should provide in-service training to institutional staff, and to parents to promote good oral health in children and adults and to help them in accessing dental care.
- Coordinated efforts between social service workers and oral health care providers should be strengthened to ensure that the professionals adequately serve these children.
- Dental Management of Special children & individuals must be incorporated as separate course in curriculum of dental institutions to train the oral health care professionals so that they can manage such children properly in the dental operatory.

The limitation of our study is that only prevalence of dental caries, dentofacial anomalies & tooth trauma has been studied, other disease which may occur in the oral cavity were not considered here. Hence it's highly recommended to consider the inclusion of other oral diseases also in future studies.

Conflicts of interest

The authors have none to declare.

Ethical approval

Ethical approval was received from Institutional Ethical Committee.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jobcr.2019.03.004.

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