Original Article

Assessment of oral health-related quality of life in 9-15 year old children with visual impairment in Uttarakhand, India

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ABSTRACT

Background: To assess the prevalence of dental diseases among 9–15-year-old visually impaired children and find out its impact on their daily activities using the Child-Oral Impact on Daily Performance (C-OIDP) questionnaire in districts of Uttarakhand, India.

Materials and Methods: A total of 423 visually impaired institutionalized children between the age group of 9–15 years were included in the study. Stratified random sampling technique was used to obtain the study population. Dental caries was recorded using dmft for primary dentition and DMFT for permanent dentition, traumatic dental injuries were assessed using traumatic dental injury index, and dentofacial anomalies were recorded using Angle's classification of malocclusion. The Hindi braille version of C-OIDP questionnaire was used to gather information regarding oral health-related quality of life (OHRQoL).

Results: There was a high dental caries prevalence of 57.7% in visually impaired children. The prevalence of traumatic dental injuries was 50.6%. Crowding (61.5%) was the most commonly seen dentofacial anomaly and the most commonly perceived oral health problem was toothache. There was less favorable OHRQoL in males as compared to females.

Conclusion: There was a high prevalence of dental diseases in this group and higher C-OIDP scores suggestive of unfavorable OHRQoL.

Key Words: Questionnaire, dentofacial deformities, dental caries, trauma, visually impaired

INTRODUCTION

Oral health has a great impact on our overall health including both physical and psychological. The interrelationship between oral and general health has been proven by evidence.[1] The WHO defines quality of life as "individual's perception of their position in life in the context of culture value system, in which they live and in relation to their goal, standards, and concerns."[1] A comprehensive National Health Survey conducted in 2004 in India clearly symbolizes that dental diseases are a significant public health burden in India.[2] The psychosocial impact of oral diseases often significantly diminishes quality of life and children are the worst affected group.[3] Children are more prone to numerous oral conditions that may have a negative impact on quality of life which may be quantified in terms of dropping out from school;

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disruption to physical activity, eating, sleeping, and studying, which may affect their emotions adversely. The gravity of the situation further deepens when we talk in terms of oral health conditions of differently abled children. Visual impairment is one such condition which relates to a person's eyesight, which cannot be corrected to normal vision. Visual impairment can be a major hindrance in maintenance of proper oral hygiene and absence of proper training further worsens this.

Clinical indicators of oral diseases were not entirely suitable to capture the new concept of health declared by the WHO.[4] Hence, researchers started to develop alternative measures that came in the form of standardized questionnaires.[5]

Oral health-related quality of life (OHRQoL) is a relatively new but rapidly growing phenomenon which has emerged over the past two decades.[4] However, they are all designed to assess OHRQoL in adult population. Since pediatric oral disorders are numerous (Surgeon General's Report, 2000) and are likely to have a negative effect on the quality of life, five of these tools were designed to assess the OHRQoL in children.[6] These include Child Perception Questionnaire, the Michigan OHRQoL scale, the Child Oral Health Impact Profile, the Early Childhood Oral Health Impact Scale, and the Child-Oral Impact on Daily Performances (C-OIDPs).[7-10] Although C-OIDP assessment has recently penetrated into the pediatric dental literature, assessment of C-OIDP in special populations such as visually impaired children has been hindered by several factors mostly lack of awareness about the same. Thus, an effort was made to appraise the impact of oral diseases on daily activities of these visually impaired children in our study by evaluating the existing oral health status of 9–15 year children with visual impairment in districts of Uttarakhand, India, with regard to dental caries experience, dental trauma, and dentofacial anomalies and assessing the impact of the oral health status if any, on quality of life of these children using C-OIDP Index.

MATERIALS AND METHODS

The present descriptive cross-sectional study had 423 male and female visually impaired children. Only 9–15-year-old children who could read and write in braille and were ready to answer the questionnaire were considered for the study. The study was conducted after due clearance from the ethical committee and the institutional research board. Prior permissions were also taken from the head of the department and principals of the special schools who participated in the study.

There are 22 schools working in the field of education, training, employment, and rehabilitation of disabled children in different states of Uttarakhand. Only five schools of them (from both Garhwal and Kumaon divisions of Uttarakhand state, i.e. from Haridwar, Dehradun, and Nainital districts) had children who were only visually impaired without any other form of disability, and so they were shortlisted for the study. The study was carried out in a span of 6 months, i.e. from February 2015 to July 2015. All the children studying in the schools were examined were legally visually impaired (both partially and completely visually impaired), i.e., one who, with the best optical correction, can see less at 20 feet than a person with normal vision can at 200 feet (visual acuity is 20/200); or whose field of vision is limited to a narrow-angle[11,12] and had severe visual impairment since birth was considered in this study. Prior consent was taken from parents/guardians of the children wherever required. Uncooperative children, those with severe systemic diseases, mentally challenged, or having any disability other than visual impairment were excluded from the study.[11,12] Baseline information of these visually impaired children was collected by means of questionnaire-record form 1 and clinical examination-record form 2. The principal investigator and teachers filled out form 1 individually for all the children as scribes to avoid discrepancy and while doing so they took care not to influence the participant's answer in any way. For recording of form 2, two house surgeons were identified and trained. The principal investigator and the two house surgeons were then calibrated for the recording the indices, based on which the kappa coefficient was calculated and was found to be ranging from 0.85 to 0.95, which was good. For the braille version of C-OIDP questionnaire, internal reliability was tested using the standardized Cronbach's alpha coefficient which was found to be 0.86.

The Type III clinical examination was carried out during the study. Dental caries was assessed using DMFT index given by Henry T Klein, Carrole E Palmer, and Knutson JW in 1938 for permanent dentition and deft index given by Gruebbel in

1944 for primary dentition.[11] Traumatic injuries were recorded with the help of traumatic dental injury (TDI) index (based on WHO classification of dental trauma).[13] Molar relation was recorded based on Angle's classification. Presence of dentofacial anomalies, i.e., open bite, cross bite, deep bite, and crowding of teeth were also recorded. Overjet more than 3 mm and overbite more than 2 mm were considered increased. Crowding was considered as present when there was overlapping of one or more teeth. Similarly, crossbite was considered present, if one or more maxillary teeth were placed palatal or lingual to mandibular teeth.[14] The braille version of C-OIDP index was used to assess the final impact of oral health-related conditions which can affect one's daily life.

The data were retrieved from precoded survey pro forma to a computer. The Excel and SPSS version 21.0 (SPSS Inc., Chicago, IL, USA) software packages were used for data entry and analysis. Categorical data were analyzed using Chi-square test for differences between groups. Correlations among sociodemographic, clinical variables, and C-OIDP impact were assessed using Pearson's correlation coefficient, and bivariate analysis was applied between the independent variables, i.e., sociodemographic and oral health indicators, and the outcome of C-OIDP to find out the significance and odds ratio. Significance for all statistical tests was predetermined at a probability value of 0.05 or less.

RESULTS

The mean age of the study population was 12.32 ± 2.25 years. The study population comprised 69% males while females were only 31%. There was a high dental caries prevalence of 57.7% among the visually impaired children with a mean DMFT of 1.64 and mean deft of 1.53 [Graph 1]. The prevalence of traumatic dental injuries was 50.6% among these visually impaired children [Graph 1]. The study sample showed the highest prevalence of Angle's Class I molar relation (62.6%). Crowding (61.5%) was most commonly seen dentofacial anomaly in the study group [Table 1]. Of all the dentofacial anomalies, there was a significant male predilection in deep bite among visually impaired children. The most commonly perceived oral health problem among visually impaired group was toothache, while on the other hand, children rated missing teeth as the least
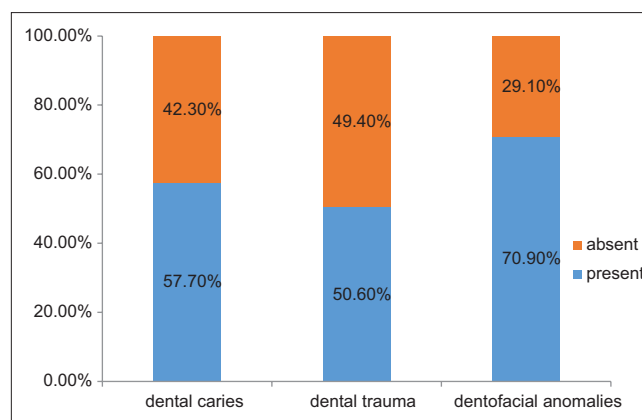
Graph 1: Prevalence of dental caries, tooth trauma, and dentofacial anomalies in the study population.

Table 1: Prevalence of different types of dentofacial anomalies and self-perceived oral health problems among the visually impaired group

Condition	Type	Percentage
Different types of dentofacial anomalies	Anterior open bite	14.9
	Posterior open bite	5.9
	Anterior crossbite	5.2
	Posterior crossbite	8.0
	Deep bite	29.0
	Crowding	61.5
Self-perceived oral health problems	Toothache	67.7
	Sensitive tooth	45.5
	Tooth decay, hole in tooth	44.8
	Exfoliating primary tooth	28.1
	Tooth space (due to nonerupted permanent tooth)	43
	Fractured permanent tooth	19.8
	Bleeding gums	43.2
	Swollen gum	25.3
	Calculus	40.8
	Oral ulcer	25.1
	Bad breath	33.1
	Erupting permanent tooth	35.4
	Missing permanent tooth	15.2

perceived oral health problem**.** Toothache was the most common oral condition affecting almost all the daily activities and had maximum impact on sleeping, studying, and eating. The overall severity of impact on daily activities was 30.45% and the overall frequency of impact on daily activities was 29.7%. The C-OIDP impact showed highly significant positive correlation with age, study group, and significant negative correlation with DMFT [Table 2]. The male participants tended to have higher C-OIDP scores as compared to females thus suggesting less favorable OHRQoL in males as compared to females. Children who presented with dentofacial deformities, dental

Table 2: Correlations among sociodemographic, clinical variables, and Child-Oral Impact on Daily Performances impact and bivariate analysis between the independent variables: Sociodemographic and oral health indicators, and the outcome Child-Oral Impact on Daily Performances with odds ratio and 95% confidence interval

Socio-demographic and Clinical variables	C-OIDP impact >0 OR (95% CI)	Pearson correlation	*P*
Age			
Under 12	1	0.250**	0.000*
More than 12 years	2.82 (2.06-3.89)*		
Gender			
Females	1	0.029	0.448
Males	1.13 (0.82-1.56)*		
Caries experience DMFT			
Absent	1	−0.106**	0.006*
Present	0.64 (0.47-0.88)*		
Dentofacial anomalies			
Absent	1	0.043	0.266
Present	1.21 (0.87-1.67)*		
TDI			
No trauma	1	−0.017	0.665
Present	0.93 (0.69-1.27)*		

*$P<0.05$. ** $P<0.01$. OR: Odds ratio; CI: Confidence interval; C-OIDP: Child-Oral Impact on Daily Performance; TDI: Traumatic dental injury

caries, and traumatic dental injuries reported higher C-OIDP scores suggestive of unfavorable OHRQoL.

DISCUSSION

The first objective of our study was to measure components of oral health status among visually impaired children 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 C-OIDP index. The perceptions of the shape, color, and alignment of teeth can vary from person to person and can affect people accordingly. Keeping this in mind, the self-reported or patient-reported health outcomes such as OHRQoL were used in our study.

Of all the available OHRQoL measures, C-OIDP inventory has the ability to provide information on condition-specific impacts whereby the respondent attributes the impacts to specific oral conditions or diseases; thus contributing to the needs assessment and the planning of oral health-care services.[15] Hence, we used C-OIDP questionnaire in our study. In the classical questionnaire, the participating children were first presented with a list of 16 impairments: toothache, sensitive teeth, tooth decay (cavity in teeth), exfoliating primary teeth,

tooth space (due to a nonerupted permanent tooth), fractured permanent tooth, color of tooth, shape or size of tooth, position of tooth, bleeding gum, swollen gum, calculus, oral ulcers, bad breath, deformity of mouth or face, erupting permanent tooth, and missing permanent tooth. However, in this study, visually impaired participants were not prompted on all the 16 impairments. Those that were dropped were color, shape and size, position, and deformity of mouth or face – assuming that the participants could not make a fair judgment based on their visual challenge. The questionnaire was first translated into Hindi as it's the most commonly spoken language in this region and for ease of understanding by the children. This Hindi version was then translated in braille for the visually impaired children. The braille version was distributed to them, and scribes were used to record their answers.

There were concerns that children's cognitive capacities and communication skills may compromise the validity and reliability of their QoL reports.[16,17] However, Wilson-Genderson *et al*. in their review suggested that self-report of QoL and health status is feasible in 9–15-year-old children as age effects should no longer be significant.[18] At this age, children have a good capacity to remember, retrieve, and apply information related to specific events and experiences.[18] Their matured language skills and ease in independent reading allow for the comprehension of items and meet the demands of self-reported questionnaires.[18] Further, children at this stage, reflective of Piaget's stage of formal operations, have matured intellectual functioning and are capable of making the comparative judgments required for representations of oral health status and QoL. Their judgments regarding their general and specific abilities are, in fact, realistic.[19] 9–15-year-old children view health as a multidimensional concept organized around constructs such as being functional, adhering to good lifestyle behaviors, and having a general sense of well-being and relationships with others.[18] In addition, they have a greater appreciation of illness, disease, and disability in that each can be understood based on causality and multisystem understanding.[18,19]

The prevalence of dental caries in the present study was 57.7% in visually impaired group. It was more than that seen in a similar study conducted among institutionalized visually impaired children in South India by Reddy and Sharma[20] in 2011, where the

caries prevalence was 40% and mean DMFT/deft was 1.1 and 0.17.[20] Another study conducted by Chand *et al*.[21] in 2014 in Indore, Madhya Pradesh, had found mean DMFT/deft of 0.97/0.46 in visually impaired children. This was in accordance with the results reported in our study. Furthermore, similar studies conducted in central India (Udaipur) by Jain *et al*.[22] in 2013 where mean DMFT/deft was 1.9/1.7 in visually impaired had similar results for dental caries prevalence as that present in our study. Sanjay *et al*.[23] in 2014 conducted a study in Maharashtra which also showed similar results with mean DMFT/deft of 2.1/2.0 in visually impaired population. Probable reason for some variations seen in different studies conducted through the latitudes and longitudes in India could be variable access to dental care, inadequate oral hygiene, and many other disability-related factors, their diet, medications, physical limitations, lack of oral hygiene, and attitude of caretaker/parent and health-care providers.

The sample group showed the highest prevalence of Class I molar relation (62.6%) followed by Angle's Class II at 32.9% in visually impaired and finally Class III which was seen in 4.5% visually impaired. This was similar to the results reported by Avasthi *et al*. in 2011 in sensory impaired children in Delhi-Gurgaon region where they had used similar parameters to check for dentofacial anomalies.[24]

Crowding was most commonly seen dentofacial anomaly in the study group present in 61.5% of the study population. Of all the dentofacial anomalies, there was a significant male predilection in deep bite among visually impaired children. These results corroborate with survey carried out by Avasthi *et al*. in 2011 in Delhi – Gurgoan region[24] and Muppa *et al*. in south India in 2013, which reported that there was anterior crowding in 27.37% of the total sample size, deep bite in 20.5%, Class I in 14.34%, anterior spacing in 12.9%, Class II in 9.95%, Class III in 5.33%, anterior crossbite in 4.98%, and open bite in 4.62%.[25] The discrepancy in the percentages could be because of difference in the genetic pattern of both the study populations.

In our study, the visually impaired group had more occurrence of TDI at 50.6%. This was similar to that reported by Agrawal *et al*.[26] in 2013 and Avasthi *et al*.[24] in 2011 in Delhi region. Another study conducted by Bhat *et al*. in 2011 in Udaipur showed a prevalence of 33% of traumatic dental injuries among 12–15 year age group.[27] A probable cause for this variation in prevalence could be the difference in the sample size and facilities and supervision present at the institution.

In our study, eating was the most common performance affected by poor oral health as per C-OIDP inventory. This was similar to the results seen for normal school-going children aged 12–15 year in a survey done by Usha *et al*. in 2013 (Davangere)[28] using C-OIDP questionnaire and also in another survey done among the National Cadet Corps aged 12–15 years of Udupi district, India, in 2013 using C-OIDP inventory.[29]

The C-OIDP impact showed highly significant positive correlation with age, study group, and significant negative correlation with DMFT. The male participants tend to have higher COIDP scores as compared to females thus suggesting less favorable OHRQoL in males. Participants >12 years of 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, and traumatic injuries reported higher COIDP scores suggestive of unfavorable OHRQoL. There was only one study conducted in Khartoum state, Sudan by Tagelsir *et al*.[30] in 83 visually impaired children where they tested the C-OIDP questionnaire. They found an impact of 1.8 in their population. Probable difference noted here may be due to huge difference in the sample size.

Furthermore, there was a difference in the mode of delivery of C-OIDP questionnaire which was verbal in their case, and we had given a braille version of C-OIDP questionnaire to children. Thus, it makes our study first of its kind to use the braille version of C-OIDP questionnaire which has not been done anywhere in the world. The children in our study were able to read and write in braille which could also have an impact on their understanding of the questions and thereby generating an improved response to the questionnaire. Limitation of this study is that factors such as parent education and socioeconomic status could not be considered as it was conducted among institutionalized children of whom most were orphans and/or abandoned by family very early in life.

CONCLUSION

In hilly terrain of Uttarakhand, dental diseases still exist as a smoldering disease that has ingressed

its tentacles deep due to lack of public awareness and motivation. Within the limitations of the study, visually impaired individuals here showed a higher prevalence of dental caries, traumatic dental injuries, and dentofacial anomalies. Hence, special oral health care measures tailor-made for this special population must be implemented at the earliest. Furthermore, provision of oral health education in special schools including proper instructions on oral hygiene practices in braille language must be implemented at the earliest.

Financial support and sponsorship
Nil.

Conflicts of interest
The authors of this manuscript declare that they have no conflicts of interest, real or perceived, financial or nonfinancial in this article.

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