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Oral Health Status, Severity of Malocclusion and Orthodontic Treatment Needs in Children with SHCN In Delhi-NCR - A Survey Based Study

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ABSTRACT

Background: Etiology of malocclusion is multifactorial and mainly determined by genetic factors and environmental factors. Improvement of oral health in a population begins with the collection of epidemiological data, which helps to understand the needs of our community to identify the high-risk groups, then to carry out extensive planned treatment, prevention strategies and monitor the development of the situation over a period of years.

Materials and methodology: The survey was conducted by examining 150 children with special healthcare needs in Delhi-NCR after obtaining consent form from their guardians/caregivers. WHO Oral Health Assessment Form (2013) for children was used for recording oral health status of the subjects. Information was collected through this form that included general information pertaining to study subjects like Name, Date of Birth, Age, and Gender. Examination was done using mouth mirror and Community Periodontal Index of Treatment Needs probe. The firmly established Index of Orthodontic Treatment need (IOTN) was utilized for the present study. IOTN has two parts; the Aesthetic (AC) and Dental Health (DHC) components. The Aesthetic Component consists of a scale of 10 color photographs showing different levels of dental attractiveness, grade 1 representing the most attractive and grade 10 the least attractive dentitions. And the Risk Of Malocclusion Assessment Index (ROMA INDEX) is an index to assess treatment priority in young patients was also used for treatment priority.

Results: The distribution of the dental caries susceptibility among the study subjects was 17.1% involving primary dentition and 15.9% involving permanent teeth in the hearing disabled group, 39.5% involving primary dentition and 47.7% involving permanent teeth for the intellectually disabled, 22.5% involving primary dentition and 22.7% involving permanent teeth for the physically challenged study subjects and 20.9% involving primary dentition and 13.6% involving permanent teeth in visually impaired groups. According to the Index of Orthodontic Treatment Need, a larger proportion of participants were observed to have great need for orthodontic treatment need (47%) giving a score of IOTN 4. Also, it arose that patients at extreme risk require immediate intervention which is about 53.7% gives a score of ROMA GRADE 5. This result was found to be statistically significant.

Conclusion: The results show a high prevalence of oral diseases, malocclusion, and orthodontic treatment needs in this population. Furthermore, the study suggests that early orthodontic treatment can help prevent traumatic dental injuries and improve overall oral health outcomes and increase the quality of life in this population. Therefore, it is crucial to develop programs and policies that promote oral health and orthodontic treatment for these children.

Keywords: *Special Healthcare Needs, the Index of Orthodontic Treatment Need, Risk of Malocclusion Assessment Index, Treatment priority.*

1. INTRODUCTION

The AAPD states that special health care needs individuals as "any physical, developmental, mental, sensory, behavioural, cognitive, or emotional impairment or limiting condition that needs medical management, health care intervention, and also use of specialized services or programs. These conditions can also be developmental, congenital, acquired through disease, trauma, or environmental and might impose limitations in performing daily self-maintaining activities or substantial limitations in day-to-day major life activities. Healthcare official trained for individuals with special health care needs require specialized knowledge acquired by additional training."[1,2]

Children with special health care needs are considered as being in the category of high risk for dental disease and manifest a higher percentage of malocclusion than individuals without disability. This may be due to higher incidence of craniofacial malformations in these individuals, dysfunction of stomatognathic complex, retarded growth and development, disharmony between lip and tongue posture and poor orofacial tone. These children with special healthcare needs also have difficulty in achieving appropriate dental services. For them maintenance of a good oral health is very important as poor oral hygiene makes the function of the common oral functions like chewing, swallowing and speech difficult for them resulting in poor general health adding to their co-morbidity and malocclusion, compromised esthetics. Also, malocclusion in individuals with mental disability is an additional barrier to social acceptance.[3]

It has been estimated that about 5-5.5 million persons are with special health care needs in India in the age group criteria of 12-24 years old.[4] Among various other oral disease, the threat of malocclusion has received barely any of the attention and the epidemiology is also not being adequately studied. We as pediatric dentist need to question ourselves whether we believe and accept the fact that the functional and esthetic requirements of children with disability demand our equal attention as that of children without disability. Bestowing attentiveness to interceptive orthodontic demands and dentofacial problems in such children can have a major impact on their quality of life and boost their confidence. Etiology of malocclusion is multifactorial and is mainly determined by genetic factors and environmental factors for instance.[5] Moreover, caries and premature loss of primary teeth are considered pre-disposing or added factors for occlusal and space anomalies in the mixed and permanent dentition. Hence, the present study was an attempt to assess and compare the prevalence of orthodontic treatment need and caries prevalence in children with special health care needs in Delhi-NCR.

2. METHOD

Sample size estimation: Sample size was calculated using G Power Software (version 3.0.10). Based on the calculated effect size of 0.26, 5% level of precision, 95% confidence level and 80% power of the study, 150 special care needs aged between 6-15 years old from Delhi and Delhi-NCR region were included in the study.

WHO Oral Health Assessment Form (2013) for children was used for recording oral health status of the subjects. Information was collected through this form that included general information pertaining to study subjects like Name, Date of Birth, Age, and Gender. Examination will be done using mouth mirror and Community Periodontal Index of Treatment Needs probe. Help of guardians/caretaker was taken for communication with the children. Clinical assessment included recording of dentition status of child for caries and its effect like missing or filled teeth due to caries. Gingival status was assessed by recording gingival bleeding using CPITN probe. Presence and severity of dental erosion, dental fluorosis and dental trauma was assessed. A tooth was classified as missing if it had not erupted after six months of its expected eruption date. A tooth was classified as retained if it was still in the arch after six months of its expected date of exfoliation.

The firmly established **Index of Orthodontic Treatment need (IOTN)** was utilized for the present study. IOTN has two parts; the Aesthetic (AC) and Dental Health (DHC) components. DHC has been used for the study, which have been grouped following validation into grades 1 and 2 representing 'slight or no need for treatment, grade 3 representing 'borderline' cases, and grades 4 and 5 representing those in 'great need of orthodontic treatment'. The DHC was only applied clinically for the study. Fixed number of autoclaved instruments was carried to the examination site to avoid the interruption during the study.

Risk Of Malocclusion Assessment Index (ROMA INDEX) is an index to assess treatment priority in young patients. It was developed modifying the dental and occlusal parameters of DHC of IOTN with the addition of items related to skeletal and functional problems, to identify the risk of worsening of the malocclusion during growth. Considering the negative effects of malocclusion on both the dento-skeletal apparatus and on psycho-social well-being, the index identifies five grades, each degree of risk calls for more or less urgent intervention.

Data was collected by examination of oral cavity and capturing photographs. Study participants privacy was ensured. Some children and adolescents with SHCN had to examine with the help of their teachers/care-givers. Few children were very uncooperative and couldn't be examined properly and had to exempted from the study. The children were examined in a designated space provided by the administration, seated on an ordinary chair unless they were confined to a wheelchair, under natural light with a dental mirror, probe and metal millimeter ruler.

3. RESULT

Table 1 represent the demographic characteristics of study population. Of the 150 participants in the study, the majority (56.7%) were male (n=43.3%) were female. Patient ages ranged from 6-15 years (mean: 10.27±5.19 years). It shows the distribution of subjects by age, sex and type of disability. Intellectual disabled children formed highest proportion (n = 58) among various SHCN types and children with hearing disabled were the least in number (n = 26). (Table 2).

Table 1: Mean age of the study population

Groups	N	Mean age	S.D.	p-value
Hearing disabled	26	10.27	2.22	**0.445**
Intellectually disabled	58	10.16	2.16	
Physically disabled	37	10.03	2.30	
Visually impaired	29	9.41	2.24	
Total	150	10.00	2.22	

One way ANOVA applied, p-value significant at $p<0.05$

Table 2: Distribution of study population according to gender

Groups	Males		Females		Total	
	N	%	N	%	N	%
Hearing disabled	18	69.2	8	30.8	26	100.0
Intellectually disabled	29	50.0	29	50.0	58	100.0
Physically disabled	16	43.2	21	56.8	37	100.0
Visually impaired	22	75.9	7	24.1	29	100.0
Total	85	56.7	65	43.3	150	100.0

The distribution of the dental caries susceptibility among the study subjects showed that the percentage of dental caries susceptibility was 17.1% involving primary dentition and 15.9% involving permanent teeth in the hearing disabled group, 39.5% involving primary dentition and 47.7% involving permanent teeth for the intellectually disabled, 22.5% involving primary dentition and 22.7% involving permanent teeth for the physically challenged study subjects and 20.9% involving primary dentition and 13.6% involving permanent teeth in visually impaired group. From the result it can be concluded that most affected group is the Intellectual Disabled one followed by the physically disabled, hearing disabled and least in the visually impaired ones. (Table-3 and 4)

Table 3: Prevalence of dental caries among the study population

Dentition type	Caries present		Caries absent	
	N	%	N	%
Primary dentitio	129	86.0	21	14.0
Permanent dentiti	44	29.3	106	70.7

Table 4: Prevalence of dental caries according to type of SHCN

Groups	Primary dentition		Permanent dentition	
	Caries present	%	Caries present	%
Hearing disablec	22	17.1	7	15.9
Intellectually disab	51	39.5	21	47.7
Physically disable	29	22.5	10	22.7
Visually impaire	27	20.9	6	13.6
Total	129	100.0	44	100.0

The distribution of dentition status among the study subjects showed that the mean number of total Missing teeth due to caries was 1.97, 2.26 Decayed teeth and 1.18 Filled teeth study subjects and a mean of dmf score to be 2.63 for all the study groups. (Table 5 and Table 6)

Table 5: Mean decayed, missing and filled teeth (dmf) in primary dentition among different SHCN categories

Dentition type	Decayed		Missing		Filled		dmf	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Hearing disable	6.18	1.73	1.43	0.51	1.0	0.0	6.86	2.20
Intellectually disabled	5.43	2.31	1.90	1.22	1.33	1.15	5.83	2.45
Physically disab	5.21	2.38	2.38	1.19	1.20	0.45	5.53	2.98
Visually impair	5.26	2.43	2.20	1.26	1.00	0.0	6.28	2.80
Total	5.47	2.26	1.97	1.14	1.18	0.60	6.02	2.63
p-value	0.425		0.131		0.949		0.250	

One way ANOVA applied

Table 6: Mean decayed, missing and filled teeth (DMF) in permanent dentition among different SHCN categories

Dentition type	Decayed		Missing		Filled		dmf	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Hearing disable	1.71	1.11	-	-	1.00	-	1.62	1.06
Intellectually disabled	1.62	0.97	-	-	1.00	-	1.56	0.92
Physically disab	1.40	0.52	-	-	1.00	-	1.42	0.51
Visually impair	1.33	0.82	-	-	1.00	-	1.28	0.76
Total	1.55	0.87	-	-	1.00	0.0	1.50	0.83
p-value	0.804		-		-		0.834	

One way ANOVA applied

Bleeding on probing was present among 37.8% of the physically disabled followed by 26.9% in the hearing disabled, 25.9% of the intellectually disabled study subjects and least seen in 24.1% visually impaired group respectively. These results were not statistically significant (P = 0.557). (Table-7).

Table 7: Periodontal status among the study population

Groups	0		1	
	N	%	N	%
Hearing disabled	19	73.1	7	26.9
Intellectually disabled	43	74.1	15	25.9
Physically disabled	23	62.2	14	37.8
Visually impaired	22	75.9	7	24.1
Total	107	71.3	43	28.7

Chi square 2.074, p=0.557 (non significant)

The percentage of children present with some form of teeth with trauma was among 21.6% of the physically disabled, 11.5% of the hearing disabled, 8.6% of the intellectually disabled study subjects and 6.9% among and visually impaired group respectively. (Table-8). These results were statistically significant (P = 0.006).

Table 8: Prevalence of dental trauma among the study population

Groups	0		2		3	
	N	%	N	%	N	%
Hearing disabled	8	30.8	15	57.7	3	11.5
Intellectually disabled	12	20.7	41	70.7	5	8.6
Physically disabled	14	37.9	15	40.5	8	21.6
Visually impaired	6	20.7	21	72.4	2	6.9
Total	40	26.7	92	78.0	18	21.3

Chi square 23.836, p=0.006 (significant)

The total percentage of children requiring urgent intervention was 79.3% of the intellectually disabled study subjects followed by 69.2% of the physically disabled, 67.2% of the visually impaired group respectively and 61.1.% of the hearing disabled. These results were highly statistically significant (P =0.001). (Table-9)

Table 9: Intervention urgency among the study population

Groups	1		2		3	
	N	%	N	%	N	%
Hearing disabled	4	15.4	5	15.4	18	61.1
Intellectually disabled	4	6.9	15	25.9	39	79.3
Physically disabled	4	10.9	10	27.0	22	69.2
Visually impaired	1	3.5	5	17.2	23	67.2
Total	13	8.7	35	23.3	102	68.0

Chi square 12.822, p=0.001 (significant)

Out of total 150 children, 129 had mixed dentition and 44 had permanent dentition. None of the children were witnessing or had experienced orthodontic treatment for malocclusion. According to the DHC of IOTN (Table 10), a larger proportion of

participants with SHCN were observed to have great need for orthodontic treatment need (47%) giving a score of IOTN 4 which means "severe degrees of irregularity and these do require treatment for health reasons." And about (15.4%) showed "severe dental health problems." Orthodontic treatment indication for (9.4%) and (26.2%) SHCN children and adolescents was "minor irregularities" or "greater irregularities which normally do not need treatment for health reasons" with their IOTN scores being 2 and 3 respectively. This result is statistically significant (p= 0.038).

Table 10 outlines, for each grade of risk considered in this study (Table 11) and the corresponding group of patients, it arose that patients at extreme risk require immediate intervention which is about 53.7% gives a score of ROMA GRADE 5,17.4% had a score of ROMA GRADE 4; 6% had a score of ROMA GRADE 3 and 14.8% had a score of ROMA GRADE 2 whereas for great or moderate risk cases there is lower priority and treatment can be delayed until the active growth period (Table 11). In statistical terms, the result is significant (p = 0.001).

Table 10: IOTN grading among the study population

Groups	1		2		3		4		5	
	N	%	N	N	%	N	%	%	N	%
Hearing disabled	0	0	4	15.4	11	42.3	7	26.9	4	15.4
Intellectually disable	1	1.7	2	3.4	12	20.7	33	56.9	10	17.2
Physically disabled	2	5.6	2	5.6	6	16.7	20	55.6	6	16.7
Visually impaired	0	0	6	20.7	10	34.5	10	34.5	3	10.3
Total	3	2.0	14	9.4	39	26.2	70	47.0	23	15.4

Chi square 21.926, p=0.038 (significant)

Table 11: ROMA grading among the study population

Groups	1		2		3		4		5	
	N	%	N	N	%	N	%	%	N	%
Hearing disabled	3	11.	5	19.2	0	0	3	11.5	13	57.7
Intellectually disable	2	3.4	3	5.2	4	6.9	12	20.7	37	63.8
Physically disabled	3	8.3	4	11.1	2	5.6	5	13.9	22	61.1
Visually impaired	4	13.	7	24.1	2	6.9	6	20.7	10	34.5
Total	12	8.1	22	14.8	9	6.0	26	17.4	80	53.7

Chi square 8.654, p=0.001 (Significant)

FIGURE 1: ARMAMENTARIUM

(A) **(B)**

FIGURE 2- (A) CHILDREN BEING EXAMINED UNDER NATURAL LIGHT (B) CARE-TAKER/PARENTS HELP TAKEN WHEN REQUIRED

FIGURE 3- ORAL EXAMINATION WAS DONE USING MOUTH MIRROR AND COMMUNITY PERIODONTAL INDEX OF TREATMENT NEEDS PROBE AND FINDINGS ARE NOTED ON WHO ORAL HEALTH ASSESSMENT FORM (2013) FOR CHILDREN

FIGURE 4- EXAMINATION FOR ORTHODONTIC TREATMENT NEED. THE FIRMLY ESTABLISHED INDEX OF ORTHODONTIC TREATMENT NEED (IOTN) WAS UTILIZED FOR THE TREATMENT NEED & RISK OF MALOCCLUSION ASSESSMENT INDEX (ROMA INDEX) TO ASSESS TREATMENT PRIORITY.

4. DISCUSSION

This study aimed to determine the oral health status, malocclusion prevalence, complexity and orthodontic treatment need in children with special healthcare needs. Outcome parameters were WHO-OHA assessment form (2013) to determine oral health status, ROMA to determine malocclusion assessment risk and IOTNDHC to determine orthodontic treatment needs. Result shows that oral disease among individuals with special healthcare needs represent a major health issue and it has been seen that SHCN tend to have more decayed teeth. The results also demonstrate that both malocclusion assessment risk and orthodontic treatment need are statistically significant in children with SHCN, independent of age and sex.

When DMFT indexes were examined with regards to gender, the mean DMFT was found to be higher for males in the present study. This is contradictory with literature, which has typically found dental caries to exhibit a higher prevalence among females than males. In one previous national population survey, rates of caries among the disabled population were found to be higher in comparison to the general population for all age groups studied.[6] Not only did children with disabilities tend to have more decayed teeth when compared to children without disabilities, they also had more number of missing teeth and higher incidences of poor gingival health.[6]

In the present study, the oral status of the SHCN children studied was rather found to be poor, with plaque accumulation found in approximately one in every three subjects. Data from a previous study done on 12-year-old disabled children in Flanders showed poor oral hygiene in 31.8% of children, with no significant differences seen.[7] A study done on mentally retarded female children in Riyadh also showed very poor oral hygiene.[8] Several other study results also found poor results for periodontal health and poor oral cleanliness seen in children with disabilities.[7,8] The reason behind these result may be due to low physical abilities, which is causing difficulties in cleaning teeth.

Children with visually impairments were found to have a lower prevalence of trauma compared to what is reported in the study. The current study reported a lower prevalence of TDI among children with visual impairment (6.9%) compared to other (8.6%-21.6%) reports in the study. The same applies to children with hearing impairment who showed a lower prevalence (4.3%) compared to the 10.5%-12.5% reported in the literature.[6,7,8] Most of these mentioned incidences were reported to be occurred at homes and were caused by trauma from fall, suggesting the need for awareness and educational programs to increase the knowledge among parents/caregivers regarding TDI prevention. Generally, increased overjet with protruded upper anterior teeth to be the most important risk factor for TDI.[9]

The most cited reasons for not seeking treatment were challenges in treating children with SHCN in the clinical setting, lack of treatment awareness, dependence of these individuals to accompany them to appointment, transportation issue, negativity involving treatment in dentistry (such as fear and resistance) and the high cost of dental treatment.[10,11,12] Most important is suggested the need for additional education for parents of SHCN about the importance of prevention and early treatment of TDI.[13,14]

Coming to the orthodontic need in the children with special healthcare needs, the result according to the DHC of IOTN, a larger proportion of participants with SHCN were observed to have great need for orthodontic treatment need which is 47% of the study sample giving a score of IOTN 4 which means “severe degrees of irregularity and these do require treatment for health reasons.” And about 15.4% showed “severe dental health problems.” Orthodontic treatment indication for 9.4% and 26.2% SHCN children and adolescents was “minor irregularities” or “greater irregularities which normally do not need treatment for health reasons” with their IOTN scores being 2 and 3 respectively. This was statistically significant ($p= 0.038$). In line with a previous study, the result demonstrated that the prevalence of malocclusion is statistically significantly in children with ASD.[15]

According to the survey by Bali et al.[16] the prevalence of orthodontic treatment needs among the SHCN children attending special needs schools was 50.2% which was found to be very high as compared to non- SHCN cohorts., which ranged from 23.6% among 12 years old to 23.9% among 15 years old. Similar results were found in another study which was conducted by Borzabadi-Farahani et al. (21.8%).[17]

The result shows 58% of the intellectually disabled affected by some form of mal-alignment and reported malocclusion followed by 36% of the physically disabled, 26% of the hearing disabled and 29 of the visually impaired. This is comparable to that of studies conducted by Onyeaso[18] and Utomii and Onyeasoii[19] which reported 58% and 59% malocclusion respectively. Intellectually disabled groups showed a high malocclusion prevalence among all other study group and also these children recorded a considerable higher amount of anterior mandibular overjet, which points out to the fact that these children have higher prevalence of mid-facial discrepancy, uncoordinated movements of the tongue and low tonicity of perioral muscles. Additionally, other factors such as the delayed eruption and exfoliation of primary and secondary set of dentitions, habit of tongue thrusting because of factors like macro-glossia and hypotonic ligament of mandibular joint.[20] Whereas, lower proportion of malocclusion which was noted in hearing impaired group can be explained by stating the reason that these children present lesser deleterious oral habits and better motor coordination.[21]

Talking of the risk of malocclusion, this study shows that 71.1% of the population needed an immediate orthodontic treatment (score ROMA 4 and 5) and 19.2% requires follow-ups and is likely to commence an orthodontic therapy at a later stage,

when the skeletal growth is more in favour (scores 3 and 2). According to previously cited literatures, some of the occlusal characteristics of primary dentition keep on persisting in mixed dentition as well and children with problem of malocclusion in primary dentition (posterior crossbite, increased overjet, etc) shows higher risks of having a malocclusion in early mixed dentition [Góis, 2012][22] and an anterior open bite may improve over period of time as the child ages [Bowden, 1966; Heimer et al., 2008; Worms et al., 1971; Cozza et al., 2005; Warren and Bishara, 2002].[23] But some authors suggest that an early treatment can help [Bhayya, 2011].[24] Preventive and early treatments in orthodontics are still a topic of debate.[Tschill et al., 1997;[25] Proffit, 2006].[26], and according to Proffit [2006],[26] ideal time for a treatment is in late-mixed dentition stage, while other authors considered [Thilander et al, 1984;[27] Farnik et al.,[28]1988; Ovsenik et al.,[29] 2004] early orthodontic treatments desirable especially to enhance skeletal and dental discrepancies and correct habits, and especially the transverse discrepancies which may cause some form of facial discrepancies and TMJ problems [Kurol, 2006; Proffit, 2006].[26] Ricketts [1979] suggests and validate that an early treatment guides the normal dental exfoliation and an orthodontic treatment is advisable in deciduous or early-mixed dentition while helping the normal development of mixed and permanent dentitions. Early orthodontic therapies also help to prevent traumatic dental injuries and therefore, it is necessary a programme for the education of parents on the importance of periodic follow-ups and sessions of oral hygiene for these children with special healthcare and need for government and non-governmental organizations to give more attention to orthodontic care of people with special needs in India.

5. CONCLUSION

This study highlights the importance of oral health issues and orthodontic treatment needs among children with special healthcare needs (SHCN). The results show a high prevalence of oral diseases, malocclusion, and orthodontic treatment needs in this population. However, it is essential to acknowledge the limitations of this study. The sample size is relatively small, which may limit the generalizability of the findings to the broader population of children with SHCN. Future studies with larger sample sizes and more diverse populations are necessary to confirm these results and provide a more comprehensive understanding of the oral health needs of children with SHCN. Despite this limitation, the study emphasizes the need for additional education for parents and caregivers on the importance of prevention and early treatment of oral health issues and orthodontic needs in children with SHCN. Furthermore, the study suggests that early orthodontic treatment can help prevent traumatic dental injuries and improve overall oral health outcomes and increase the quality of life in this population. Therefore, it is crucial to develop programs and policies that promote oral health and orthodontic treatment for children with SHCN, and to provide education and support to parents and caregivers to ensure that these children receive the care they need.

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