

Orthodontic treatment need among special health care needs school children in Dharwad, India: A comparative study

Prajna P Nayak, KVV Prasad¹ and Y Manohar Bhat¹

ABSTRACT

Objectives: The aim was to assess and compare the prevalence of orthodontic treatment need among various special health care needs (SHCN) schoolchildren and adolescents in Dharwad, India.

Materials and Methods: This cross-sectional study was carried out among 492 subjects in age group of 12-19 years (mean age 14.02 ± 1.84 standard deviation [SD]) who were examined for occlusal anomalies using dental aesthetic index (DAI). They were classified into five groups as: Visual impairment, speech and hearing disability (SH), physical disability, mentally subnormal and multiple disabilities (MD). Chi-square test was used to compare the orthodontic treatment need among various SHCN groups. One-way ANOVA and ANCOVA were performed to test any significant differences in mean DAI scores among the SHCN groups.

Results: None of the children were undergoing or had undergone orthodontic treatment for malocclusion. Mean DAI score was 28.81 ± 11.64 (SD). Orthodontic treatment was indicated in 50.2% of study population who had DAI scores of 26 and above. Mandatory orthodontic treatment (DAI ≥ 36) was required in as high as 29% of MD individuals when compared to only 10% of SH individuals. Significant differences in DAI scores were found between the SHCN groups.

Conclusions: The need for orthodontic treatment among SHCN individuals was found to be high. Yet, absence of any orthodontic treatment for any child points out to the fact that the dental services are highly needed in these individuals.

Key words: Dental aesthetic index, malocclusion, orthodontic treatment need, prevalence, special health care needs

INTRODUCTION

High-risk groups like special health care needs (SHCN) population suffers from a disproportionate share of untreated diseases. These diseases, in turn, have a significant impact on their health adding to the despair and burdening their already ailing health. SHCN children and adolescents are recognized as being in the category of high-risk for dental diseases, and they also have difficulty in accessing appropriate dental services.^[1-3] For them, maintenance of a good oral health is very important as poor oral health makes the functions of oral cavity like eating, swallowing, speech and chewing difficult for them resulting in malocclusion, compromised esthetics and poor general health adding to their co-morbidity.^[4]

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Healthy people 2010 objectives emphasize the need to reduce disparities in health, between the general population and high-risk groups. In India, persons with disabilities (equal opportunities, protection of rights and full participation) act of 1995.^[5] The Rehabilitation Council of India Act of 1992,^[6] second working draft of Rights of Persons with Disabilities Act of 2011^[6] are strong legal instruments dealing with the rights of SHCN persons. However, dental services are not being delivered to them pertinently. The oral health is neglected either because of their disabling condition, a demanding disease or limited access to oral health care.^[7,8]

It was estimated that there are about 5–5.5 million persons with SHCN in India in 12–24 years age group.^[9] Among

Access this article online	
Quick Response Code:	Website: www.jorthodsci.org
	DOI: 10.4103/2278-0203.156029

various oral diseases, the threat of malocclusion has received barely any attention and the epidemiology has not been adequately studied. For these individuals, it is required to improve the dentofacial apparatus, not only for better oral functions, but also to have a proper co-ordination within society. Oral health improvement in a population begins with the collection of epidemiological data, which helps to understand the needs of the community, to identify high-risk groups, and to plan treatment and prevention strategies and monitor the development of situation over a period of several years.^[7] Hence, the present study was attempted to assess and compare the prevalence of orthodontic treatment need in SHCN children studying in special needs schools in Dharwad district of South India.

MATERIALS AND METHODS

A descriptive, cross-sectional survey was carried out in Dharwad district, which is a major commercial hub of South India and has a population of about 1.8 million. There are about 800 individuals studying in 14 special needs schools in Dharwad. All 492 individuals in the age group of 12–19 years were included in the study. All individuals were classified into five groups^[10] as: Visual impairment (VI), speech and hearing (SH) disability, locomotor/physical disability (PD)/orthopedic disability: With cerebral palsy, arthritis, congenital deformities, poliomyelitis, spina bifida (PD), mentally subnormal (MS): With down's syndrome, autism, learning disability (MS) and multiple disabilities (MD): With a combination of above (MD).

Ethical clearance was obtained from Institutional Review Board. Informed consent was obtained from school authorities and from parents/guardians through the schools to conduct the study. Subjects were included, if they were 12 years of age or above, were present on the day of examination, and were willing to participate. Subjects were excluded from the study if they were uncooperative or had any medical conditions, which contraindicated an oral examination without appropriate modifications such as infective endocarditis, coagulopathy, abscess, etc., All examinations were conducted by a single investigator (PPN), assisted by a previously trained recorder.

Examiner Reliability

To assess reproducibility, 30 subjects were re-examined after 1-week. Spearman rank correlation coefficient was used to test the association between dental aesthetic index (DAI) scores on the two occasions. The rank order correlation ($r = 0.95$, $P < 0.001$) showed a high level of reliability for the malocclusion assessments.

Data on demographic variables was obtained from parents/guardians/school teachers prior to the child's dental examination. Various demographic data such as name, age at last birthday, gender, residence, school, religion and mode of dental health care facility in the school were collected.

Dental Esthetic Index

Occlusal anomalies were recorded as per DAI, according to WHO guideline components and using all 10 measures. The total score obtained from 10 measures along with the regression coefficient formed DAI score. Orthodontic treatment need was determined based on DAI score as no treatment need, elective treatment, highly desirable or mandatory treatment required.^[11,12] As DAI index is not recommended for children below 12 years of age, only those children above 12 years of age were considered for assessing malocclusion.^[12,13]

Statistical Analysis

Using the statistical package STATA 9.2 (StataCorp. 2005. Stata Statistical Software: Release 9. College Station, TX: StataCorp LP, USA) the statistical analysis was done. Descriptive statistics was performed as well as the test of association between malocclusion severities among various SHCN groups, and their association with each of the ten 10 DAI components, using Chi-square test. One-way ANOVA was performed for comparison between SHCN groups and mean DAI scores and pair wise comparison was done by Newman–Keuls *post-hoc* procedures. ANCOVA analysis was done by taking age as a covariate. The $P < 0.05$ was set to know the significance level.

RESULTS

Table 1 gives the demographic characteristics of study population. MS children formed highest proportion ($n = 192$) among various SHCN types and children with MD were the least in number ($n = 31$). None of the children were undergoing or had undergone orthodontic treatment for malocclusion. Orthodontic treatment indication for 49.8% SHCN children and adolescents was “no or slight need” with their DAI scores being < 25 . Other half of them had orthodontic treatment need ranging from “elective” to “highly desirable” to “mandatory” (50.2%). As high as 29% of MD individuals required mandatory orthodontic treatment as compared to only 10% of SH individuals, which was statistically significant ($P < 0.05$) [Table 2].

Maxillary irregularity of > 1 mm was observed in 218 (49.1%), of which PD children had a highest prevalence (57.5%) which was statistically significant ($P \leq 0.05$). Of those with anterior maxillary overjet of 3 mm or more, the PD children formed highest proportion (42%), which was statistically significant. The frequency of anterior open bite of > 1 mm was 37 (8.3%) and the difference between the groups was significant ($P \leq 0.001$). Children with MD showed the highest proportion of anterior open bite (27.3%) followed by MS children (12.8%). The prevalence of half cusp and full cuspal molar relations were significantly lower among VI and SH when compared to other disabling conditions ($P \leq 0.000$) [Table 3].

Speech and hearing children had lowest mean DAI scores of 24.2 ± 7.3 (SD) among all the SHCN types, followed by VI with 26.9 ± 9.1 mean DAI score. On the other hand, children with MD

Table 1: Distribution of study population by SHCN condition, mean age and median age

SHCN type	n (%)	Gender		Dentition		Mean age (SD)	Median age
		Male	Female	Mixed	Permanent		
Visually impaired	69 (14)	53	16	33	36	13.39 (1.32)	13
SH impaired	130 (26.4)	84	46	45	85	13.61 (1.27)	13
Physically disabled	88 (17.9)	63	25	29	59	13.72 (1.52)	14
Mentally subnormal	174 (35.4)	72	102	50	124	14.43 (2.18)	14
MD	31 (6.3)	18	13	8	23	16.46 (2.36)	17
Total	492 (100)	290	202	165	327	14.02 (1.84)	14

SHCN – Special health care needs; SD – Standard deviation; MD – Multiple disabilities; SH – Speech and hearing

Table 2: Distribution of study population according to orthodontic treatment need

DAI score	<25	26-30	31-35	36 and above	Total
Severity of malocclusion	No abnormality or minor malocclusion	Definite malocclusion	Severe malocclusion	Very severe malocclusion	
Treatment indication	No or slight need	Elective	Highly desirable	Mandatory	
SHCN type (%)					
Visually impaired	33 (47.8)	15 (21.7)	10 (14.5)	11 (15.9)	69
SH impaired	82 (62.1)	26 (20)	9 (6.9)	13 (10)	130
Physically disabled	48 (54.5)	11 (12.5)	8 (9.1)	21 (23.9)	88
Mentally subnormal	70 (40.2)	38 (21.8)	27 (15.5)	39 (22.4)	174
Multiple handicap	12 (38.7)	5 (16.1)	5 (16.1)	9 (29.0)	31
Total	245 (49.8)	95 (19.3)	59 (12)	93 (18.9)	492

 $\chi^2=21.75$, $df=4$, $P=0.001^*$ (*Kruskal–Wallis test). SHCN – Special health care needs; DAI – Dental aesthetic index; SH – Speech and hearing**Table 3: Distribution of study population according to DAI components**

SHCN type	Total (n)	Missing >1 tooth (%)	Crowding ≥ 1 segment (%)	Spacing ≥ 1 segment (%)	Diastema ≥ 1 mm (%)	Largest maxillary irregularity >1 mm (%)	Largest mandibular irregularity >1 mm (%)	Anterior maxillary overjet >3 mm (%)	Anterior mandibular overjet >1 mm (%)	Anterior openbite >1 mm (%)	Antero-posterior relation >1/2 cusp mesial or distal (%)
Visually impaired	69	2.9	52.2	24.6	12	50.7	24.6	37.7	7.2	1.4	27.5
SH impaired	130	6.2	42.3	31.8	18.6	37.5	18.5	13.8	6.2	2.3	23.8
Physically disabled	88	8.0	55.7	27.6	14.9	57.5	21.6	42	6.8	12.6	62.5
Mentally subnormal	174	7.5	57.8	27.6	21.9	53.0	25.0	35.2	9.8	12.8	45.8
MD	31	15.4	53.8	46.2	23.9	54.5	15.4	19.4	6.5	27.3	69.2
Total	492	6.2	52.4	28.5	19.1	49.1*	22.4	31.3**	7.7	8.3***	41.1****

 $\chi^2=10.451$, $P=0.033$; $\chi^2=36.791$, $P=0.000$; $\chi^2=17.669$, $P=0.001$; $\chi^2=43.918$, $P=0.000$. SHCN – Special health care needs; DAI – Dental aesthetic index; MD – Multiple disabilities; SH – Speech and hearing

showed highest mean DAI score of 32.5 ± 12.8 among all the SHCN types. One-way ANOVA showed significant differences in the mean DAI scores in various SHCN types ($F = 7.715$, $P \leq 0.0000$). Age adjusted ANCOVA analysis also revealed same results. ($F = 7.23$, $P \leq 0.0000$). Pair-wise comparison of mean DAI scores by Newman–Keuls *post-hoc* procedures showed significant differences ($P < 0.05$) in the mean DAI scores between MD and VI children and between MD and SH children [Table 4].

Mouth breathing, thumb sucking and tongue thrusting were significantly associated with the DAI scores in SHCN children and adolescents ($P < 0.01$) [Table 5].

DISCUSSION

In the present study, all 14 special needs schools registered at block education office of Dharwad were included. The SHCN children were classified into five categories as given by the guidelines for evaluation of various disabilities and procedure for certification (2008) based on the notification by Ministry of Social Justice and Empowerment by the Government of India (2001).^[10]

The prevalence of orthodontic treatment need among the SHCN children and adolescents attending special needs schools was 50.2% which is very high as compared to non-SHCN cohorts

Table 4: Comparison of DAI scores among various SHCN groups

SHCN type	Mean DAI (SD)	Age (SD)	Estimated marginal mean (SE) ^{2,#}	95% confidence interval for mean
Visually impaired	26.92 (9.06)	13.00 (1.65)	27.02 (1.3)	24.75-29.11
SH impaired	24.11 (7.32) ^a	13.28 (1.61)	24.16 (1.00)	22.84-25.38
Physically disabled	29.36 (12.26)	13.52 (1.78)	29.39 (1.21)	26.76-31.96
Mentally subnormal	30.77 (13.56) ^b	14.43 (2.53)	30.41 (0.87)	28.84-32.70
MD	32.92 (12.38) ^b	14.77 (2.30)	33.10 (2.05)	25.44-40.41
Total	28.81 (11.64)	14.02 (1.9)		27.25-29.31
F	7.715		7.23	
P	0.0000*		0.0000*	

Mann-Whitney U-test – $P < 0.01$ statistically significant between a and b (a: SH impaired, b: Mentally subnormal and MD), 1 – ANOVA; 2 – ANCOVA; [#]Covariate – age-13.78.
SHCN – Special health care needs; DAI – Dental aesthetic index; SD – Standard deviation; SE – Standard error; MD – Multiple disabilities; SH – Speech and hearing

Table 5: Comparison of malocclusion in the SHCN groups according to habits

Habit	Mean DAI score (SD)	t	df	Significant (two-tailed)
Mouth breathing				
Present (n=128)	33.89 (14.24)	-	490	0.000*
Absent (n=364)	26.3 (9.86)	5.577		
Thumb sucking				
Present (n=12)	38.42 (21.33)	-	490	0.002*
Absent (n=480)	28.02 (11.21)	3.082		
Tongue thrusting				
Present (n=73)	36.68 (17.20)	-	490	0.000*
Absent (n=419)	26.81 (9.67)	7.008		
Teeth grinding				
Present (n=20)	29.85 (14.16)	-	490	0.538
Absent (n=472)	28.21 (11.5)	0.617		

* $P < 0.05$. SD – Standard deviation; SHCN – Special health care needs; DAI – Dental esthetic index

according to the nationwide survey by Bali *et al.*, which ranged from 23.6% among 12 years old to 23.9% among 15 years old.^[14] Similar findings were found in the study conducted by Borzabadi-Farahani *et al.* (21.8%).^[15] Mean DAI score in the present study is 28.81 ± 11.64 standard deviation, which is slightly lower than the reported figure by Vellappally *et al.* (39 ± 12.3) in 12-18-year-old disabled adolescents.^[16]

Proportion of severe/handicapping malocclusion requiring mandatory orthodontic treatment (DAI ≥ 36) was also high in our study population (18.9%) as compared to only 50.1% in the study of Vellappally *et al.*^[16] Another study conducted by Eslamipour *et al.*, in general population, also showed a lower prevalence in the general population (10.9%).^[17] This higher prevalence of orthodontic treatment need in our study population might have arisen as a consequence of the causative factors, which produced the overall defect.^[18]

Among them, the need for orthodontic treatment ranged from a sizable proportion of 61.3% in MD and 59.8% in MS groups to a lesser proportion of 37.9% in SH group. This is comparable to that of studies conducted by Onyeaso^[19] and Utomii and Onyeaso^[20] which reported 58% and 59% malocclusion respectively. The high prevalence of malocclusion among MD and MS groups could be because of alterations in cranial base relationships, especially in diseases like Down's syndrome, functional anomalies and uncoordinated movements of tongue and low tonicity of perioral muscles. In addition, the delayed eruption and exfoliation of primary and secondary dentition, characteristic tongue thrust and hypotonic ligamentary apparatus of mandibular joint play a major role in malocclusion.^[21] Lower proportion of malocclusion in hearing and speech impaired group can be explained by the fact that these children present comparatively lesser amount of dento-alveolar discrepancies, lesser prevalence of deleterious oral habits and better motor co-ordination.^[22] Higher proportion of severe/handicapping malocclusion was seen among MD and PD children as measured against the other groups. This is in agreement with the findings of Shyama *et al.*^[18] and Oliveira *et al.*^[22] Compounding of causative factors in MD and higher proportion of children with cerebral palsy in PD group may possibly be the reason for this finding.

All the DAI components showed higher values in this disabled population as compared to studies conducted among their normal counterparts.^[23,24] In a study conducted by Borzabadi-Farahani *et al.*^[23] a symmetric molar relationship was found in 69.5% of the subjects, which was only 41.1% in the present study. In another study conducted by Chauhan *et al.*^[24] one or more missing anterior teeth were found in only 0.7% of subjects as compared to 6.2% in the present study. Similarly, anterior maxillary irregularity of > 1 mm was seen in only 13.6% of subjects as compared to 49.1% in the present study.

Proportion of largest maxillary irregularity and anterior maxillary overjet were significantly more prevalent in PD children which is in consistent with the findings of Dinesh *et al.*^[25] and Franklin *et al.*^[26] MS children recorded a considerable amount of anterior mandibular overjet, which points out to the fact that these children have higher prevalence of mid-facial hypoplasia and macroglossia. In addition, such children will be more vulnerable to stress because he or she has inadequate concept of his or her environment. This in turn, will result in emotional insecurity and force to diversify into deleterious habits. Vertical anterior open bite of > 1 mm incurred in the maximum proportion among multiple SHCN (27.3%), which can be attributed to deficient maxillary growth and abnormal tongue size. And the results were similar to that conducted by Vigild (23%),^[27] but higher than that conducted by Dinesh *et al.* (7%).^[25] Children with MD (30.8%) and PD (37.5%) had a proportionally lesser number of individuals with normal molar relations when compared to other groups, which is consistent with other studies.^[21,22,27]

Nonetheless, the study has few limitations. Inclusion of healthy controls would have given more scope for comparison, not only among disabled groups, but also with the able bodied cohorts. In addition, even though DAI index is one of the most common indices used to assess malocclusion, lack of assessment of occlusal anomalies such as buccal crossbite, impacted teeth and center-line discrepancy weakens the index and would not provide a clear picture of different components of the malocclusion.^[28,29] The use of more contemporary indices in this group, to explore various important occlusal traits, is recommended.^[30,31]

CONCLUSIONS

The present study gives an outline of dentofacial diversities among various SHCN groups in Dharwad, India. Half of them had orthodontic treatment need ranging from “elective” to “highly desirable” to “mandatory.” Significantly higher frequencies of anterior maxillary overjet, anterior open bite and antero-posterior molar relation were noted among MD group and anterior maxillary irregularity in PD individuals. Absence of any orthodontic treatment for any child with malocclusion points out to the fact that the dental services are highly needed in these individuals. Only way to approach this at public level is through health education programs concerning both the parent and the patient.

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How to cite this article: Nayak PP, Prasad K, Bhat YM. Orthodontic treatment need among special health care needs school children in Dharwad, India: A comparative study. *J Orthodont Sci* 2015;4:47-51.

Source of Support: Nil, **Conflict of Interest:** None declared.