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Original Research Article

Prevalence of malocclusion and orthodontic treatment needs in children with special needs in district Mandi, Himachal Pradesh, India

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ABSTRACT

Introduction: Malocclusion plays an important role in overall oral health of every individual because it is associated with periodontal disease, temporomandibular disorder and may be complicated by an individual disability and special need.

Aims and Objectives: To determine the prevalence of malocclusion in children with special needs in District, Mandi, Himachal, Pradesh, India, using DAI and IOTN, and to assess whether the observed malocclusion is affected by sex.

Materials and Methods: The study was consists of 200 children with mental retardation, physical disability, sensory impairment between 10-18 years of age from various special schools for people with special needs. A pre-structured proforma was used to record the findings and socio-demographic information. The special need children were examined in respective schools under natural light, using Dental aesthetic Index (DAI) and Index of orthodontic treatment need (IOTN).

Results: The prevalence of the malocclusion was found to be more in the subjects with the mental retardation and physical disability followed by hearing and visual impairment. There were no statistically significant differences in DAI and IOTN scores between gender.

Conclusion: The need for orthodontic treatment was found to be more in mentally retarded group than the other groups of special need children as per the IOTN and DAI scores in District, Mandi, Himachal, Pradesh.

1. Introduction

"Special needs" is a term used in clinical diagnostic and functional development to describe individuals who require assistance for disabilities that may be mental or physical and their severity can differ in different individual. Although every special-needs child is different, there are some common concerns that link all of them in getting appropriate care with all medical, dental facilities and accommodation, promoting acceptance in the extended family, school and community, planning for uncertain future, adjusting routines and expectations.[1] The year 1981 was declared as international year of handicapped so as to initiate normal health for these special groups.[1] Mental retardation is defined as an effectual theoretical intelligence, which can be congenital or acquired early in life.[2] According to data collected from rehabilitation council of India there are less than 800 special school in whole country providing services to an estimate d 25,000 special children. These statistics clearly show that handicapped individuals in India are neglected.[3]

Malocclusion plays an important role in overall oral health of an individual because it is associated with periodontal disease, temporomandibular disorder and may

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be complicated by an individual disability.[4] Though many factors may contraindicate treatment, it should in many cases be possible to improve dental situation for this group, thereby helping these patients to better oral function.[5]

The process of improving oral health in population begins with the collection of epidemiological data which helps to understand needs of 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. The data on dental diseases among disabled children in Himachal population is limited. Hence the aims and objectives of the present study were to estimate and evaluate the prevalence, severity and orthodontic treatment needs among males and females with mentally retardation, physically disability, hearing impairment, and visual impairment in district Mandi, Himachal Pradesh.

2. Materials and Methods

The study was conducted in the Department of Orthodontics and Dentofacial Orthopaedics, in order to estimate the prevalence, severity of malocclusion in special need children of District Mandi, Himachal Pradesh, India. Ethical approval for conducting the study was taken from the institutional research ethical committee(vide no HDC/Ethical/ORTHO/2021/03). The epidemiological survey was carried out in various special schools in and around Sundernagar, District Mandi, Himachal Pradesh, with the permission from school administration.

The study included 200 individuals,100 males and 100 females aged between 10-18 years and were divided into four groups (50 in each group). Group I (50individuals with mental retardation), Group II (50individuals with physical disability), Group III (50individuals with hearing impairment), Group IV (50individuals with visual impairment) as shown in Tables 1 and 2.

Individuals were selected on following inclusion criteria: individuals with special need (mental retardation, physical disability, hearing and visual impairment), mixed and permanent dentition, age 10-18 years and not being previously submitted to orthodontic treatment. The exclusion criteria were: individuals with any facial trauma, and non- cooperative behaviour.

2.1. Methodology

2.1.1. Dental aesthetic index (DAI)

Scores for each of the ten morphologic characteristics assessed by the DAI namely: number of missing visible teeth, crowding and spacing in the incisal segments,midline diastema, anterior irregularity in the maxillary and mandibular arches, anterior maxillary overjet and mandibular overjet, vertical anterior open bite and the anteroposterior molar relationships were determined by direct measurement. The multiplication of these scores by the weighting factor, summation of the products and a constant produced the total DAI score. The DAI scores were graded into four groups based on the predefined DAI categories. (a)Scores of 13–25 represent Grade1 (normal or minor malocclusions with slight or no treatment need) (b) scores of 26–30 represent Grade2 (definite malocclusions with treatment considered elective) (c)scores of 31–35 represent Grade3 (severe malocclusions with treatment highly desirable) and (d)scores of 36 and higher represent Grade4(very severe or disabling malocclusions with treatment considered mandatory).

2.1.2. Index of orthodontic treatment need (IOTN)

Each participant's orthodontic treatment need, was determined with the DHC component of IOTN. For the dental health component (DHC), each occlusal trait thought to contribute to the longevity and satisfactory functioning of the dentition was examined, dental health impairments were identified and the most severe trait was the basis for grading an individual's orthodontic treatment need.

2.1.3. Clinical examination

The individuals were examined under natural sunlight[6] as a source of illumination in the school premises using disposable gloves, mouth mirrors, calibrated scale and WHO periodontal probe as shown in Figure 1. The different measurements were taken with the help of WHO periodontal probe and calibrated scale.The basic infection control protocol was followed during the clinical examination and autoclaved mouth mirrors and periodontal probes were taken to the examination site in order to avoid any interruption during the study while examining the subjects. The subjects in group I i.e mentally retarded were seated on chair and examined by following the different approaches such as desensitisation (for avoiding anxiety and fear), effective communication (clear and uncomplicated verbal contact)[7] and TELL, SHOW, DO approach as shown in Figure 2. The subjects of group II, group III, group IV were seated on the chair in upright position and were examined by retracting the cheek and lip with the help of mouth mirror as shown in Figures 3, 4 and 5.

2.2. Statistical analysis

After clinical examination, the data was recorded, compiled, tabulated and then analyzed using the SPSS (version 21). The estimation and prevalence of malocclusion was evaluated by using Frequency Distribution Charts. The estimation and comparison of severity scores using DAI and the treatment needs using DHC Dental Health Components of the IOTN among males and females of Mandi District, Himachal Pradesh was assessed by using Chi-Square test.The statistical significance was set at $p< 0.05$.

Table 1: Frequency distribution of the subjects used in the study

Groups	Subjects with special need	Male	Female	Total
Group I	Subjects with mental retardation	25	25	50
Group II	Subjects with physical disability	25	25	50
Group III	Subjects with hearing impairment	25	25	50
Group IV	Subjects with visual impairment	25	25	50
Total		100	100	200

Table 2: Gender distribution of the subjects used in the study

Subjects	No. Of subjects	Percentage (%)
Males	100	50
Females	100	50
Total	200	100

Table 3: Prevalance of malocclusion among males and females with mental reatrdation using dai components in district Mandi, Himachal Pradesh

Dai components		Males		Females	
		N	%	N	%
Missing visible teeth	>1	2	8	1	4
Crowding	1-2	4	16	3	12
Spacing	1-2	6	24	8	32
Midline diastema	>1	5	20	3	12
Anterior irregularity in maxilla	>1	4	16	5	20
Anterior irregularity in mandible	>1	5	20	6	24
Overjet	>3	6	24	4	16
Reverse overjet	>0	5	20	6	24
Open bite	>0	3	12	2	8
Antero-posterior molar relationship	$> \frac{1}{2}$ unit cusp	8	32	5	20

Table 4: Prevalance of malocclusion among males and females with physical disability using dai components in district Mandi, Himachal Pradesh

Dai components		Males		Females	
		N	%	N	%
Missing visible teeth	>1	2	8	0	0
Crowding	1-2	6	24	8	32
Spacing	1-2	3	12	4	16
Midline diastema	>1	2	8	3	12
Anterior irregularity in maxilla	>1	4	16	6	24
Anterior irregularity in mandible	>1	2	4	1	4
Overjet	>3	7	28	5	20
Reverse overjet	>0	2	8	1	4
Open bite	>0	1	4	1	4
Antero-posterior molar relationship	$> \frac{1}{2}$ unit cusp	5	20	6	24

3. Results

The prevalence of the malocclusion was found to be more in the subjects with the mental retardation and physical disability followed by hearing and visual impairment among males and females using DAI components in District Mandi, Himachal Pradesh as shown in Tables 3, 4, 5 and 6. The severity score of DAI in various groups among males and females, was found more in subjects with mental retardation and there were no statistically significant differences in DAI scores between gender as shown in table VII and graph 3. The prevalence of the malocclusion was found to be more in the subjects with the mental retardation and physical disability followed by hearing and visual impairment according to overall severity score of DAI in various groups using chi-square test in district Mandi, Himachal Pradesh and there were no statistically significant differences between groups as shown in table VIII and graph 4.

Table 5: Prevalance of malocclusio among males and females with hearing impairment using dai components in district Mandi, Himachal Pradesh

Dai components		Males		Females	
		N	%	N	%
Missing visible teeth	>1	0	0	1	4
Crowding	1-2	4	16	5	20
Spacing	1-2	3	12	2	8
Midline diastema	>1	1	4	1	4
Anterior irregularity in maxilla	>1	4	16	3	12
Anterior irregularity mandible	>1	0	0	0	0
Overjet	>3	7	28	6	24
Reverse overjet	>0	0	0	0	0
Open bite	>0	0	0	0	0
Antero-posterior molar relationship	$> \frac{1}{2}$ unit cusp	6	24	7	28

Table 6: Prevalance of malocclusion among males and females with visual impairment using dai components in district Mandi, Himachal Pradesh

Dai components		Males		Females	
		N	%	N	%
Missing visible teeth	>1	1	4	0	0
Crowding	1-2	6	24	5	20
Spacing	1-2	5	20	5	20
Midline diastema	>1	1	4	1	4
Anterior irregularity in maxilla	>1	5	20	5	20
Anterior irregularity in mandible	>1	0	0	0	0
Overjet	>3	5	20	7	28
Reverse overjet	>0	0	0	0	0
Open bite	>0	0	0	1	4
Antero-posterior molar relationship	$> \frac{1}{2}$ unit cusp	6	24	7	28

Table 7: Estimation and comparison of severity score of dai in various groups among males and females using chi square test in district mandi, himachal pradesh

Groups	Normal (≤ 25)		Elective (26-30)		Severe (31-35)		Very severe (> 35)		X^2	P
	N	%	N	%	N	%	N	%		
Mental Retardation										
Males	3	12	2	8	12	48	8	32	1.51	0.680
Females	2	8	4	16	10	40	9	36		
Physical disability										
Males	2	8	5	20	11	44	7	28	1.50	0.682
Females	4	16	4	16	8	32	9	36		
Hearing impairment										
Males	4	16	5	20	9	36	7	28	0.359	0.949
Females	3	12	6	24	8	32	8	32		
Visual impairment										
Males	5	20	5	20	8	32	7	28	0.170	0.982
Females	5	20	4	16	7	28	9	36		

*p< 0.05 = significant

Table 8: Estimation and comparison of overall severity score of dai in various groups using chi square test in district Mandi, Himachal Pradesh

Groups (n =50 each)	Normal (≤ 25)		Elective (26-30)		Severe (31-35)		Very severe (> 35)		X^2	P
	N	%	N	%	N	%	N	%		
Mental retardation	5	10	6	12	22	44	17	34	5.92	0.74
Physical disability	6	12	9	18	19	38	16	32		
Hearing impairment	7	14	11	22	17	34	15	30		
Visual impairment	10	20	9	18	15	30	16	32		

*p< 0.05 = significant

Table 9: Estimation and comparison of dhc grades of index of treatment need in various groups among males and females using chi square test in district Mandi, Himachal Pradesh

Groups	No treatment grade 1		Mild treatment Grade 2		Borderline Grade 3		Severe Grade 4		Extreme Grade 5		X^2	P
	N	%	N	%	N	%	N	%	N	%		
Mental retardation												
Males	2	8	1	4	2	8	12	48	8	32	1.52	0.82
Females	3	12	2	8	1	4	9	36	10	40		
Physical disability												
Males	1	4	2	8	5	20	10	40	7	28	2.56	0.63
Females	3	12	3	12	4	16	6	24	9	36		
Hearing impairment												
Males	4	16	4	16	3	12	8	32	6	24	1.00	0.91
Females	4	16	3	12	5	20	6	24	7	28		
Visual impairment												
Males	3	12	4	16	3	12	7	28	8	32	1.10	1.00
Females	2	8	5	20	5	20	7	28	6	24		

*p< 0.05 = significant

Table 10: Estimation and comparison of overall DHC grades of index of treatment need in various groups using chi square test in District Mandi, Himachal Pradesh

Groups (n=50 each)	No treatment grade 1		Mild treatment Grade 2		Borderline Grade 3		Severe Grade 4		Extreme Grade 5		X^2	p
	N	%	N	%	N	%	N	%	N	%		
Mental retardation	5	10	3	6	3	6	21	42	18	36	11.09	0.521
Physical disability	4	8	5	10	9	18	16	32	16	32		
Hearing impairment	8	16	7	14	8	16	14	28	13	26		
Visual impairment	5	10	9	18	8	16	14	28	14	28		

*p< 0.05 = significan

Figure 1: Armamentarium used for clinical examination in the study

Figure 2: Clinical examination of subject with mental retardation (Group I)

Figure 3: Clinical examination of subject with physical disability (Group II)

Figure 4: Clinical examination of subject with hearing impairment (Group III)

Figure 5: Clinical examination of subject with visual impairment (Group IV)

Further-more according to DHC grades of index of treatment need in various groups among males and females malocclusion was found more in subjects with mental retardation as compared to other groups and there were no statistically significant differences in DHC grades between gender as shown in Table 9. The prevalence of the malocclusion was found to be more in the subjects with the mental retardation and physical disability followed by hearing and visual impairment according to overall DHC grades of index of treatment need in various groups using chi-square test in district Mandi, Himachal Pradesh and there were no statistically significant differences between groups as shown in Table 9.

4. Discussion

Malocclusion is the third highest prevalent oral pathologic conditions, secondary to tooth decay and periodontal disease and hence, needs careful attention for each and every individual whether he or she is normal or special need

children. Special health care needy children face difficulty in accessing dental care services as compared to the normal population and are identified as being in the category of high risk for oral diseases.

4.1. Subjects with mental retardation

The prevalence of missing visible teeth was found to be, in 8% male subjects and in 4% female subjects with mental retardation as shown in table III. This might be due to the poor cooperation of the mentally retarded patients with the dental treatment and the dental therapy often has been the extraction due to the inherent difficulties in performing the other treatment modalities resulting in more number of the missing teeth in these subjects. This was in accordance to the study done by Pieper et al(1986)[8] and Ozgul et al(2014).[6]

More-over crowding in incisal segment was prevalent in 16% male subjects and in 12% female subjects with mental retardation as shown in Table III**.** This is because of the irregularity in shape and size of the maxilla in these subjects. This was in accordance to the study done by Cohen et al(1970).[9]

Anterior irregularity in maxilla was found in 16% male subjects, in 20% female subjects and anterior irregularity in mandible was found in 20% male subjects, in 24% female subjects as shown in Table III. These findings are the result of the insufficient bone development, orofacial muscle hypotonia and the positioning of the tongue and decreased development of the middle third of the face. This was in accordance to the studies done by Alkhadra et al(2017).[8]

The prevalence of open-bite was found in 12% male subjects and in 8% female subjects as shown in Table III**.** The reason could be attributed to deficient maxillary growth, abnormal tongue size as the contributing factor for the vertical anterior overbite. The studies done by Rao D(2003)et al.[4]

Anteroposterior molar relationship was found in 32% male subjects and in 20% female subjects with mental retardation as shown in TableIII. The prevalence of ClassIII molar relationship could be attributed to the decreased maxillary base length and decreased development of middle third of face. The oral dysfunctions and parafunctions of the masticatory system is being responsible for the prevalence of the malocclusion in mentally retarded subjects. These results were in accordance to the study done by Alkhadra et al(2017).[8]

4.2. Subjects with physical disability

The spacing was prevalent in 12% male subjects and in 16% female subjects, midline diastema in 8% male subjects and in 12% female subjects and crowding in 24% male subjects and in 32% female subjects with physical disability as shown in TableIV. Further the results showed that the anterior irregularity in maxilla was found in 16% male subjects, in 24% female subjects and anterior irregularity in mandible was found in 4% male subjects, in 4% female subjects as shown in Table IV. This might be due to the effect of abnormal orofacial musculature on the shape of the maxillary arch and the tongue to exert linguobuccal pressure which leads to the anterior irregularities in the mandible in some patients and transverse discrepancies. This was in accordance to the study done by Hayder et al(2011).[10]

More-over anterior maxillary overjet was found in 28% male subjects and in 20% female subjects whereas the reverse overjet was found in 8% male subjects and in 4% female subjects as shown in Table IV**.** This is because of the buccal breathing and tongue thrusting which leads to increased overjet in these subjects as reported by the Brown and Schodel(1976).[11] The prevalence of the anteroposterior molar relationship was found in 20% male subjects and in 24% female subjects with physical disability as shown in Table IV. This could be due to the aberrant tongue and head posture in these subjects. This was in accordance to the study done by Desai et al(2001).[12]

4.3. Subjects with hearing impairment

The prevalence of missing teeth 4% in female subjects, spacing was found in 12% male subjects and in 8% female subjects, midline diastema in 4% male subjects and in 4% female subjects with the hearing impairment as shown in Table V. This might be because of the lack of dental care and neglection in such individuals. This was in accordance to the study done by the Storhaug et al(1991).[13]

Further-more crowding was found in 16% male subjects and in 20 % female subjects with the hearing impairment as shown in Table V**.** This could be explained on the basis of mesial drift of teeth into the space created due to the lack of dental care which results in missing teeth which leads to the deflection in the eruption path of the teeth in labial and lingual direction. This was in accordance to the study done by Graber et al(1988).[14]

The results of the present study showed that there was increased anterior maxillary overjet in 28% male subjects and in 24% female subjects as shown in TableV. This was in accordance to the study done by Tye-Murray N(1987)[15] and Suhani et al(2015)[16] and state.

4.4. Subjects with visual impairment

Prevalence of missing teeth 4% in male subjects, spacing was found in 20% male subjects and in 20% female subjects, midline diastema in 4% male subjects and in 4% female subjects with the visual impairment as shown in TableVI. This is because of the negligence in the oral health care and the accidental loss of the anterior teeth. This was in accordance to the study done by the Storhaug et al(1991).[17]

Further-more anterior maxillary overjet in 20% males and in 28% females with the visual impairment as shown in TableVI**.** This could be positively associated with the oral health behaviours and oral habits are the main cause of malocclusion. This was in accordance to the study done by the Lu liu et al(2019).[18]

As the subjects with visual impairment has increased prevalence of crowding, anterior maxillary irregularity, increased anterior overjet with ClassII anteroposterior molar relation hence there is need of orthodontic treatment in visually impaired. This was supported by the studies done by the Dias and Gleiser(2010)[19] who reported similar malocclusion traits in visually impaired individuals.

As the main focus of the parents or guardian is on the disabling condition and the general health and the oral health is deteriorated due to negligence which leads to the requirement of orthodontic treatment need in these subjects. This was in accordance to the study done by the Thabitha Rani S et al (2019).[20] The need for orthodontic treatment in respect DHC in visually impaired was 11.7% in study conducted by the Al-Sarheed et al (2003).[21] This might be due to the particular age group of 11-16 years in their study which was different from our study group.

A proper approach by health care professionals or an orthodontist should aim at reducing the prevalence of malocclusion in these special group children, thereby developing and improving their quality of life. Furthermore, the public or national health care services should draft policies in favour of these special need children such as education, motivating their parents, caretakers or guardians so that they could significantly benefitted in preventing or treating malocclusions.

5. Conclusion

1. The prevalence of the malocclusion was found to be more in the subjects with mental retardation and physical disability followed by hearing and visual impairment.
2. On the basis of DAI, the severity of malocclusion and the treatment required in special need children was found to be as follows:
   (a) Treatment is highly desirable in 44% subjects with mental retardation,38% subjects with physical disability,34% subjects with hearing impairment and 30% subjects with visual impairment.
   (b) Treatment is mandatory in 34%subjects with mental retardation,32% subjects with physical disability,30%subjects with hearing impairment and 32% subjects with the visual impairment.
3. On the basis of IOTN, the orthodontic treatment need in special need children was found to be as follows:
   (a) Severe treatment need in 42% subjects with mental retardation,32% subjects with physical disability,28% subjects with hearing impairment and 28% subjects with visual impairment.
   (b) Extreme treatment need was found in 36% subjects with mental retardation,32% subjects with physical disability,26% subjects with hearing impairment and 28% subjects with visual impairment.
4. There was statistically no significant difference was found with respect to the severity and treatment need of the malocclusion among male and female subjects with the mental retardation, physical disability, hearing impairment and visual impairment in District Mandi Himachal Pradesh.

6. Source of Funding

None.

7. Conflict of Interest

None.

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