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Research Article

Prevalence of Malocclusion and Orthodontic Treatment Needs Among 12 to 15 Year Old School Children of Mangalore City, India

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ARTICLE INFO

ABSTRACT

Background: To assess malocclusion status among 12-15 year old school children using Dental Aesthetic Index and to compare severity of malocclusion and treatment needs among males and females. **Methodology:** A cross-sectional study was carried out to assess the malocclusion status of 12 to 15 year old school children of Mangalore city, Karnataka, India. Study subjects comprised of 918 school children of Mangalore city. Consent was obtained from the parents and assent was obtained from all the participants before examination. Malocclusion status was recorded using DAI index. The data obtained was coded and fed into the SPSS version 16 for analysis. **Results:** The study population consisted of 918 children aged 12 to 15 years with 47.7% being males and 52.3% being females studying in schools of Mangalore city, Karnataka, India. Minor malocclusion with no or slight need for treatment was prevalent in 72.2% of the study subjects, definite malocclusion requiring elective treatment was present in 16.2% of the participants, while 7% and 4.2% of them had severe and handicapping malocclusion respectively. **Conclusions:** 27.7% of the children were in need of orthodontic treatment. The severity of malocclusion and orthodontic needs were more among this group of population. This information is relevant for planning preventive measures.

Keywords: Malocclusion; Dental Aesthetic Index; School Children; Treatment needs

1 INTRODUCTION

Oral diseases qualify as major public health problems owing to their high prevalence and incidence in all regions of the world.[1] Currently malocclusions are third in the ranking priorities among the problems of dental public health worldwide, surpassed by dental caries and periodontal diseases.[2]

Increased concern over dental appearance has been observed during childhood and adolescence to early adulthood.[3,4] According to Klages and Zenter, a person with malocclusion may refrain oneself from social contacts, may lose career opportunities and might feel shame about their dental appearance.[5] Malocclusions can cause different problems for the patient, such as psychosocial problem related to impaired dento-facial esthetics, problems with oral functions including difficulty in jaw movements, temperomandibular joint disturbances, difficulty in mastication, swallowing and speech, greater susceptibility to trauma and accentuated periodontal disease.[6] Uptake of orthodontic treatment is influenced by the desire to look attractive, self-perception and self-esteem of dental appearance.[3]

WHO has recommended Dental Aesthetic Index (DAI) as a method of assessing the dento-facial anomalies. DAI is a cross cultural index focused on socially defined dental aesthetics.[3]

The incidence of malocclusion has been reported to vary from 11% up to 93% in different parts of the world[5]. The prevalence of malocclusion in India is 20%-43%[3,5,7]. Since studies are few and inconclusive, there is need for additional scientific data on malocclusion and orthodontic treatment needs which can be used for planning appropriate services.[8]

The objective of the study was to assess the malocclusion status among 12-15 year old school children of Mangalore City, Karnataka, India, using Dental Aesthetic Index and to compare the severity of malocclusion and treatment needs

among males and females.

2 MATERIALS AND METHODS

A cross sectional study was conducted among 12 to 15 year old school children of Mangalore city, Karnataka, India. Subjects were selected based on the following:

Inclusion criteria:
- Subjects consenting to participate in study.
- Children aged 12 to 15 years who had not undergone orthodontic treatment.
- Subjects present on the day of examination

Exclusion Criteria:
- Physical limitations where children cannot open mouth
- Subjects not willing to participate
- Subjects with mixed dentition.
- Subjects with systemic diseases or conditions
- Subjects receiving orthodontic treatment at the time of examination.

Before start of the study, ethical clearance was obtained from Institutional Ethics Committee. Official permission was taken from Block Education officer, Mangalore. Informed consent was obtained from parent before enrollment. Assent was obtained from all the participants prior to the start of the study.

Pilot study was conducted to assess feasibility of the study. Sample size was determined based on National Oral Health Survey and Fluoride Mapping, Karnataka 2002-2003[9]. The power of study was 85% and sample size was estimated to be 753. The data was recorded by 2 trained post graduate students from Department of Public Health Dentistry. The training was given by the Head of the Department. Intra and inter examiner calibration of examiners was carried out after the training. Data obtained was analyzed using Kappa statistics. Intra examiner reliability was 0.84 and inter examiner reliability was 0.92 which was nearly perfect agreement.

There were total of 51 schools from which 15 schools were selected by convenience sampling technique. Study subjects were also selected based on convenience sampling method. All participants were informed about purpose of the study and after obtaining parent's consent they were examined.

Study subjects were examined at schools. Malocclusion status was recorded using Dental Aesthetic Index. Type III clinical examination as recommended by American Dental Association (ADA) specifications was followed. Natural light was used as light source. Torch was used when there was no proper illumination. Trained recorder sat close to examiners so that instructions and codes could be easily heard and recorded. Examination of a single study subject took 4-5minutes.Instruments were sterilized in department using an autoclave before taking them to various schools. Sufficient number of autoclaved instruments was carried out to examination location. In schools, they were sterilized using hot water sterilizer. After each examination day, all instruments were autoclaved. School children requiring treatment were referred to A.J Institute of Dental Sciences, Mangalore. Study was conducted over a period of 7 months. The collected data was coded and fed in SPSS version 16 for statistical analysis. Descriptive statistics included the mean, standard deviation, frequency and percentages. The inferential statistics included the Chi square test (X^2) for comparison. The level of significance was set at 0.05 at 95% Confidence Interval.

3 RESULTS

The present study was conducted to assess malocclusion status, dentition status and treatment needs among 15 year old school children of Mangalore city, Karnataka, India. Study population consisted of 918 school children aged 12 to15 years with 438 (47.7%) males and 480 (52.3%) females. Table 1 shows distribution of study subjects according to age, i.e. 19% of study subjects were of age 12 years, 27.1% 13 years old, 30.5% were 14 years old and 23.4% were 15 year old. Mean age was calculated as 13.55 ±2.381 years.

Table 1: Distribution of study subjects according to the age

Age	Number of Subjects	Percent (%)
12	174	19
13	249	27.1
14	280	30.5
15	215	23.4
Total	918	100

Table 2 shows distribution of DAI components. Out of 918 school children, 33.8% and 15.3% had one segment and two segment crowding. One segment and two segment spacing was seen in 12.9% and 3.1% of school children respectively. Diastema of 1-4mm was seen in 7% of school children. Largest maxillary irregularity of 1-3mm and >3mm was seen in 20.1% and 2.7% of school children respectively. Largest mandibular irregularity of 1-3mm and >3mm was seen in 39.3% and 2.5% of school children respectively. Anterior maxillary and mandibular overjet of >3mm was seen in 27.9% and 0.8% of children respectively. Openbite of >3mm was seen in 0.9% of children. Normal, half cusp and full cusp molar relation was seen in 64.7%, 29.3% and 6% of children respectively.

Table 3 shows distribution of study subjects based on severity of malocclusion and treatment needs. Minor malocclusion with no or slight need for treatment was prevalent in 72.2% of study subjects, definite malocclusion requiring elective treatment was present in 16.2% of participants while 7% and 4.2% of them had severe and handicapping malocclusion respectively requiring treatment. Out of 918, there were total of 255 (27.7%) study participants with malocclusion requiring treatment of some form.

Table 4 shows comparison of severity of malocclusion and treatment needs between males and females. In present

Table 2: Distribution of DAI component

	Dai Components	Percentage (%)
	0	51
Crowding	One segment	33.8
	Two Segment	15.3
	0	84.1
Spacing	One Segment	12.9
	Two Segment	3.1
Diastema	0	93
	1-4	7
	0	77.3
Largest Maxillary Irregularity (mm)	1-3	20.1
	>3	2.7
	0	58.2
Largest Mandibular Irregularity (mm)	1-3	39.3
	>3	2.5
Maxillary Overjet (mm)	0-3	72
	>3	27.9
Mandibular Overjet (mm)	0	99.2
	>3	0.8
Open Bite (mm)	0	99.1
	>3	0.9
	Normal	64.7
Molar Relation	Half cusp	29.3
	Full cusp	6

Table 3: Distribution of study subjects according to Severity of Malocclusion and Treatment needs

Severity of malocclusion	Treatment indication	DAI Score	Frequency	Percent (%)
No abnormality or minor malocclusion	No or slight need	<25	663	72.2
Definite malocclusion	Elective	26-30	152	16.2
Severe malocclusion	Highly desirable	31-35	64	7
Very severe or handicapping malocclusion	Mandatory	≥36	39	4.2
Total			918	100.0

Table 4: The comparison of severity of malocclusion and treatment needs between males and females.

Severity of malocclusion	Treatment indication	Sex		
		Male	Female	
No abnormality or minor malocclusion	No or slight need	313 (71.62%)	349 (80.99%)	P value = 0.507 (Non-significant)
Definite malocclusion	Elective	78 (17.85%)	74 (17.17%)	
Severe malocclusion	Highly desirable	26 (5.95%)	38 (8.82%)	
Very severe or handicapping malocclusion	Mandatory	20 (4.56%)	19 (4.41%)	

study, severe and very severe handicapping malocclusion was seen among 5.96% and 4.56% of males respectively & 8.82% and 4.42% of females respectively. There was no statistically significant difference between the DAI scores and gender (p value > 0.05, p value = 0.507).

4 DISCUSSION

A wide variation in prevalence of malocclusion in different parts of the country was observed in a review conducted on malocclusion studies in India. Lack of uniformity in data collection and variations in indices used for assessing severity of malocclusion was one among the many major factors for such widespread variations.[10] Present study was taken up to assess prevalence and severity of malocclusion and orthodontic treatment needs using Dental Aesthetic Index among age group of 12 to 15 year old school children of Mangalore City, Karnataka, India.

Missing anterior teeth –In current study, there were no school children with missing teeth in respect to maxillary arch but in respect to mandibular arch, 0.5% of school children had missing anterior teeth.[3] Results of present study were in accordance with studies conducted by Chauhan et al.,[11] Garbin et al.,[2] and Kumar et al.,[1] Study conducted by Shivkumar et al.,[3] Baskaradoss et al.,[12] Rwakatema et al.,[8] and Shivkumar et al.,[7] showed higher prevalence of missing anterior teeth.

Incisal segment crowding –In current study, 33.8% and 15.3% had one segment and two segment incisal crowding respectively. Results of current study were in correlation with the studies by Shivkumar et al.,[3] and Rwakatema et al.,[8]

Incisal segment spacing — In the present study, 12.9% and 3.1% had one segment and two segment incisal spacing respectively. Current study results were in accordance with study conducted by Kumar et al.,[1] Baskaradoss et al.,[12] Shivkumar et al.,[7] and Garbin et al.,[2]

Midline diastema — In the present study, out of 918 students examined. 7% of school children had diastema. Similar results were observed by Garbin et al.,[2] Baskaradoss et al.,[12] Kumar et al.,[1] and Chauhan et al.,[11] Higher prevalence was observed in studies conducted by Rwakatema et al.,[8] and Shivkumar et al.,[3,7] This could be due to that the children may had different deleterious oral habits, mouth breathing, tongue thrusting, microdontia, abnormal labial frenum, dilacerations of central incisor and dento-alveolar discrepancies of jaws.[3]

Maxillary anterior irregularity — In the present study, 20.1% and 2.7% of total children examined had 1-3mm and >3mm of irregularity. Similar results were showed by studies conducted by Garbin et al.,[2] and Shivkumar.[3,7]

Mandibular anterior irregularity — In the current study, 39.3% and 2.5% had irregularity of 1-3mm and >3mm respectively. Similar result was observed by Garbin et al.,[2] Results from studies conducted by Shivkumar et al.,[3,7] Kumar et al.,[1] Chauhan et al.,[11] and Barkaradoss et al.,[12] showed lower prevalence of mandibular anterior irregularity.

Maxillary overjet — Results of the current study indicated that 72% of children presented with normal maxillary overjet of 0-3mm and 27.9% presented with >3mm of maxillary overjet. Similar results were observed in studies conducted by Garbin et al.,[2] and Chauhan et al.,[11]

Mandibular overjet — In the present study, 0.8% of school children recorded anterior mandibular overjet with > 1mm. The result from present study was in accordance from studies conducted by Garbin et al.,[2] Chauhan et al.,[11] Rwakatema et al.,[8] and Shivakumar et al.,[3,7]

Vertical anterior openbite –In the present study, 0.9% of the children presented with > 1mm vertical anterior openbite. Similar result was observed in study conducted by Chauhan et al.,[11]

Antero-posterior molar relationship –In the current study, 64.7% of the school children had normal antero-posterior molar relationship, 29.3% had half cusp molar relation and 6% had full cusp molar relation. Similar results were observed in study conducted by Garbin et al.,[2]

DAI score distribution — In the present study, 72.2% of school children had < 25 DAI scores with no abnormalities or minor malocclusion requiring no or slight orthodontic treatment need, 16.2% had 26-30 DAI scores with definite malocclusion requiring elective orthodontic treatment, 7% had 31-35 DAI scores with severe malocclusion requiring highly desirable orthodontic treatment and 4.2% had > 36 DAI scores with very severe/handicapping malocclusion requiring definite/mandatory orthodontic treatment. Similar results were observed in studies conducted by Rwakatema et al.,[8] Shivakumar et al.,[7] and Bhardwaj et al.,[6]

In the present study, severe and very severe/ handicapping malocclusion was seen among 5.96% and 4.56% of males respectively & 8.82% and 4.42% of females respectively. There was no statistically significant difference between the DAI scores and the gender (p value 0.05). This is result is in accordance to the studies conducted by Hegde et al.,[13] Shivkumar et al.,[3,7] and Bernabe et al.,[14]

Limitation of the present study include that the oral habits, diet history, oral hygiene practices, socioeconomic factors, type of residence, type of schools, dental caries status, history of trauma, etc. were not assessed and compared. It also fails to detect certain occlusal disorders that may have major aesthetic impact, such as deep bites or posterior crossbites, and it takes no account of the shape, size, or color of teeth and gums.

5 CONCLUSION

The study was undertaken to assess prevalence and severity of malocclusion among 12 to 15 years old, which is ideal age for correctional orthodontic treatment. According to severity of malocclusion, 11.2% of the school children had severe and very severe handicapping malocclusion that were indicated for highly desirable and mandatory treatment.

Anterior crowding and spacing was observed in 49.1% and 16% of the school children respectively. Very few children (7%) out of 918 children had midline diastema. Increased anterior maxillary overjet (>3mm) and anterior mandibular overjet (> 3mm) was observed in 27.9% and 0.8% of the total children examined. This information is relevant for oral health planning preventive measures.

DAI was effective in assessing the severity of malocclusion and their treatment needs in the group of children. The DAI appears to be the easiest to use and it does not take into account buccal cross bite, posterior openbite, central line discrepancies or a deep overbite, these factors may have considerable impact on treatment complexity and therefore weakens the index. Malocclusion is not only a single entity but rather a collation of situations each in itself constituting a problem.[3] A comprehensive community-focused oral health care intervention that includes screening or diagnostic programs, oral health education in schools, preventive and treatment programs must be implemented and strengthened to improve the oral health status of the school children in Mangalore city. The severity of malocclusion and orthodontic needs were more among this group of population may be due to different factors. Hence careful planning based on feasibility is essential for the creation of appropriate solutions.

Acknowlegdements

REFERENCES

1) Kumar DA, Varghese RK, Chaturvedi SS, Agrawal A, Fating C, Makkad RS. Prevalence of Malocclusion Among Children and Adolescents Residing in Orphanages of Bilaspur, Chattishgarh, India. *Journal of Advanced Oral Research*. 2012;3(3):18–23. Available from: https://dx.doi.org/10.1177/2229411220120304.

2) Garbina JI, Perieraperin PC, Garbin C, Lolli LF. Malocclusion prevalence and comparison between the Angle classification and the Dental Aesthetic Index in scholars in the interior of Sao Paulo state - Brazil. *Dental Press J Orthod*. 2010;15(4):94–102. Available from: https://doi.org/10.1590/S2176-94512010000400014.

3) Shivakumar KM, Chandu GN, Reddy VS, Shafiulla MD. Prevalence of malocclusion and orthodontic treatment needs among middle and high school children of Davangere city, India by using Dental Aesthetic Index. *Journal of Indian Society of Pedodontics and Preventive Dentistry*. 2009;27(4):211–218. Available from: https://dx.doi.org/10.4103/0970-4388.57655.

4) Hamamci N, Basaran G, Uysal E. Dental Aesthetic Index scores and perception of personal dental appearance among Turkish university students. *The European Journal of Orthodontics*. 2009;31(2):168–173. Available from: https://dx.doi.org/10.1093/ejo/cjn083.

5) Shreshtha BK, R Y, Basel P. Prevalence of malocclusion among high school students in Kathmandu Valley. *Orthodontic Journal of Nepal*. 2012;2(1):1–5.

6) Bhardwaj VK, Veersha KL, Shrama KR. Prevalence of malocclusion and orthodontic treatment needs among 16 and 17 year- old school-going children in Shimla city. *Himachal Pradesh Indian Journal of Dental Research*. 2011;22(4):556–560.

7) Shivakumar KM, Chandu GN, Shafiulla MD. Severity of Malocclusion and Orthodontic Treatment Needs among 12- to 15-Year-Old School Children of Davangere District, Karnataka, India. *European Journal of Dentistry*. 2010;04(03):298–307. Available from: https://dx.doi.org/10.1055/s-0039-1697843.

8) Rwakatema DS, Ng'ang'a PM, Kemoli AM. Orthodontic treatment needs amont 12-15 year-olds in Moshi, Tanzania. *East African Medical Journal*. 2008;84(5):226–232. Available from: https://dx.doi.org/10.4314/eamj.v84i5.9530.

9) Bali RK, Mathur VB, Talwar PP, Chanana HB, New Delhi: Dental Council of India. National Oral Health Survey and Fluoride Mapping. 2004.

10) Shekar BC, Kumar S, Suma S, Sukhabogi J, Manjunath B. Malocclusion status among 15 years old adolescents in relation to fluoride concentration and area of residence. *Indian Journal of Dental Research*. 2013;24(1):1–7. Available from: https://dx.doi.org/10.4103/0970-9290.114910.

11) Chauhan D, Chauhan T, Gupta K, Sachdev V. A study of malocclusion and orthodontic treatment needs according to dental aesthetic index among school children of a hilly state of India. *Journal of International Society of Preventive and Community Dentistry*. 2013;3(1):32–37. Available from: https://dx.doi.org/10.4103/2231-0762.115706.

12) Baskaradoss JK, Geevarghese A, Roger C, Thaliath A. Prevalence of malocclusion and its relationship with caries among school children aged 11 - 15 years in southern India. *The Korean Journal of Orthodontics*. 2013;43(1):35–41. Available from: https://dx.doi.org/10.4041/kjod.2013.43.1.35.

13) Hegde V, Shenoy R. Dentition status, treatment needs and malocclusion status among 15 year old school children of Mangalore-A pilot study. *Journal of Indian Dental Association*. 2010;12(4):568–569.

14) Bernabe E, Flores-Mir C. Orthodontic Treatment Need in Peruvian Young adults evaluated through Dental Aesthetic Index. *Angle Orthodontist*. 2007;6:417–421.

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