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**Original Research Article**

# Assessment of Malocclusion status in 15 year old school children of a South Indian City- A Cross- sectional Survey

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## Abstract

**Introduction:** Self appraisal of one's appearance is one of the conflicting concerns, especially in adolescence. Facial and dental aesthetics contribute majorly towards overall appearance. Malocclusion is a disorder of multiple traits which has a large impact on both individual and society in terms of discomfort, quality of life, social and functional limitations.
**Objective:** To assess the prevalence of malocclusion and orthodontic treatment needs in 15 year old school children of Davangere City, Karnataka
**Methodology:** A descriptive cross sectional study was conducted among 15 year old school children using simple random sampling technique. Socio demographic details were recorded and severity of malocclusion was assessed by Dental Aesthetic Index (DAI). Chi Square and t-test were used and the data was analysed using SPSS Version 21.
**Results:** A total of 710 children participated in the study, out of which 59% were females and 41% were males. 23.2% of the study participants had DAI scores of 26–30 with definite malocclusion requiring elective treatment, 4.4% had DAI scores of 31–35 with severe malocclusion requiring highly desirable treatment, and 1.7% had DAI scores ≥ 36 with handicapping malocclusion requiring mandatory treatment.
**Conclusion:** Majority of the children in the study (70.7%) required little or no treatment, 29.3% had definite malocclusion requiring orthodontic treatment.
**Keywords:** Malocclusion, 15 year old, school children, Dental Aesthetic Index (DAI).

## 1. Introduction

Self-appraisal of one's appearance is one of the conflicting concerns, especially in adolescence. Facial and dental aesthetics contribute majorly towards overall appearance, attainment of optimal confidence and development of proper aptitude to interact with society as a whole. [1]

Malocclusion is a manifestation of normal biological inconsistency and is a continuum ranging from an ideal occlusion to considerable deviation from normal.[2] Moreover, it is not a single entity, but rather a collection of situations, each in itself constituting a problem.[3]

Patients visiting dental clinic usually complain of irregular arrangement of teeth, forward inclination of anterior teeth, spaces between teeth and crowding of teeth. All of these irregularities lead to a compromised function while smiling, speaking or even chewing or mastication.[4] Although malocclusion is not life threatening [5], it can be considered as a public health problem due to its high prevalence, prevention and treatment possibilities[6] and hence, ranks third among world-wide dental public health priorities. [7]

Genetic, environmental, or a coalescence of both factors, along with various local factors such as adverse oral habits and anomalies in number, form and developmental position of teeth can cause malocclusion.[8] Malocclusion has been shown to affect periodontal health, increase the prevalence of dental caries and also lead to temporomandibular joint problems.[9]

The decision to pursue orthodontic treatment is influenced by the desire to look attractive, self- perception of dental appearance, self-esteem, gender, age, and peer-group norms.[10] Adolescence is that phase in life when an individual starts becoming conscious about his appearance and attractiveness. The major benefits of orthodontic treatment include improvement of physical function, prevention of tissue damage, and correction of aesthetic components.[11]

Dental Aesthetic Index (DAI) was introduced by Cons et al in 1986,[11] which links objective, clinical and subjective aesthetic factors to produce a single score that reflects severity and the treatment needs of the malocclusion.[11] A previous report has demonstrated the high reliability and validity of this index, which also compares favorably with other indices.[12,13] DAI has been adopted by the World Health Organization (WHO) as a cross-cultural index[14] and has been applied among diverse ethnic groups without any modification.[15-17]

Rarely any study has been done in recent times to assess the prevalence of malocclusion and orthodontic treatment needs in 15 year old school children in Davangere City. Thus, the present study was planned to assess the same.

### 1.1 Objective

To assess the prevalence of malocclusion and orthodontic treatment needs in 15 year old school children of Davangere City, Karnataka.

## 2. Methodology

### 2.1 Study design and Study population:

A cross-sectional descriptive survey was conducted from May 2015 to September 2015 among 15 year old school children of Davangere City, Karnataka. All the children present on the day of examination who provided a written informed consent were included in the study. Children with mixed dentition, craniofacial anomalies (clefts and syndromes) and who were undergoing or had a history of orthodontic treatment were excluded.

### 2.2 Official permission, Ethical clearance and Informed consent

Before the commencement of the study, an official permission was obtained from the District Education Officer, District Education Office (Primary and middle; Secondary), Davangere. The study was approved by the Institutional Ethical Committee of the College of Dental Sciences **(Ref No. CODS/1923/2015-2016)**. A written informed consent was obtained from the parents of all the children who fulfilled the eligibility criteria and were willing to participate in the survey.

### 2.3 Training and calibration

Training and intra-examiner calibration was carried out on 20 school children in the Department of Public Health Dentistry, College of Dental Sciences, Davangere. The intra-examiner reliability for DAI was assessed using kappa statistics, which was found to be 0.92

### 2.4 Proforma Details

A survey proforma designed with the help of WHO Oral Health Assessment form consisted of two sections:

1. General information comprising of demographic data.
2. Clinical parameter: Dental Aesthetic Index (DAI)

### 2.5 Pilot Survey

A pilot study was carried out amongst seventy 15 year old children from two schools to determine the feasibility of the study. The data regarding the total number of 15 year old school going children in Davangere City as obtained from the District Education Office and 10% of the same were included in the study. Thus, the sample size was estimated to be 710.

### 2.6 Sampling Design

Prior to instigation of the study, list of middle and high schools (Government and private) in Davangere City was obtained from District Education Office. The list so obtained showed that the city was divided in north and south zones. Simple random sampling was applied and five schools from each zone were randomly selected for the study. All the 15 year old school children enrolled in these schools, who fulfilled the eligibility criteria, were included in the study.

### 2.7 Methodology

Data was collected by a single examiner. Prior to the start of the study, official permission to conduct the study was obtained from the participating schools. A total of seven hundred ten 15 year old school children were examined. The examination for malocclusion was done according to DAI as described in WHO Oral Health Survey Basic Methods, 1997 [12] , Type-III clinical examinations were followed and the examination was done under adequate natural light in school premises. To reduce the examiner's bias, duplicate examination was conducted on 5% ($n$ =36) of the population during the course of study.

**2.8 Oral health education and Feedback referral**

Immediately after the survey, an oral health education program was conducted in the local language (Kannada) as well as in English for all children using audio – visual aids. The findings of the survey were reported to the respective school authorities and study participants requiring treatment were also referred as and when required to the Department of Orthodontics, College of Dental Sciences, Davangere.

**2.9 Statistical analysis**

The recorded data was compiled and entered in Microsoft Excel 2007 and then exported to Statistical Package for the Social Sciences (SPSS) version 21. Descriptive statistics, chi square and independent t- test were used in analysis. For all the tests, confidence interval and *p* value were set at 95% and ≤ 0.05 respectively. The power of the study was set at 80%.

## 3. Results

**3.1 Distribution of study subjects**

A total of 710 children comprising of 419 (59.01%) females and 291 (40.99%) participated in the survey. **Table 1** provides the Dental Aesthetic Index scores and orthodontic treatment needs among study subjects by gender. The same could be inferred in **Graph 1.**

**3.2 Distribution of DAI scores by gender**

As seen in **Table 2,** the overall mean DAI score of the study population was 22.83±4.85. The same could be inferred from **Graph 2.**

**3.3 Distribution of DAI components by gender**

The distribution of DAI components by gender is reported in **Table 3**. A significant association (p = 0.017) of incisal segment crowding with gender was seen with males portraying a greater prevalence of one segment (37.11%) than females (27.21%).The same could be inferred in **Graph 3.**

As could be inferred from **Graph 4**, Largest anterior maxillary irregularity was observed in 30.28% of the total children with females (33.41%) showing considerably higher prevalence as compared to males (25.77%) and this observation was statistically significant (p= 0.05).

**Table 1: Dental aesthetic index scores and orthodontic treatment needs among study subjects by gender**

| Study Participants (%) | DAI Score | Severity of Malocclusion | Treatment Indication |
|---|---|---|---|
| Female: 302 (72.08%)<br>Males: 200 (68.73%)<br>Total: 502 (70.7%) | ≤ 25 | Minor Malocclusion | No/ Slight Need |
| Female: 93 (22.19%)<br>Males: 73 (25.08%)<br>Total: 166(23.38%) | 26–30 | Definite Malocclusion | Elective Treatment |
| Female: 16 (3.81%)<br>Males: 14 (4.81%)<br>Total: 30 (4.22%) | 31-35 | Severe Malocclusion | Highly Desirable Treatment |
| Female: 8 (1.9%)<br>Males: 4 (1.4%)<br>Total: 12(1.69%) | ≥ 36 | Very Severe/ Handicapping Malocclusion | Mandatory Treatment |

**Test used: Chi Square (χ2) test, *p*- value = 0.18 (Non- significant)**

**Table 2: Mean dental aesthetic index score among study subjects by gender**

| Number of Participants (%) | DAI Score | |
|---|---|---|
| | Mean | Standard Deviation |
| Females: 419 (59.01%) | 22.69 | 4.96 |
| Males: 291 (40.99%) | 23.02 | 4.75 |
| Total: 710 (100%) | 22.83 | 4.85 |

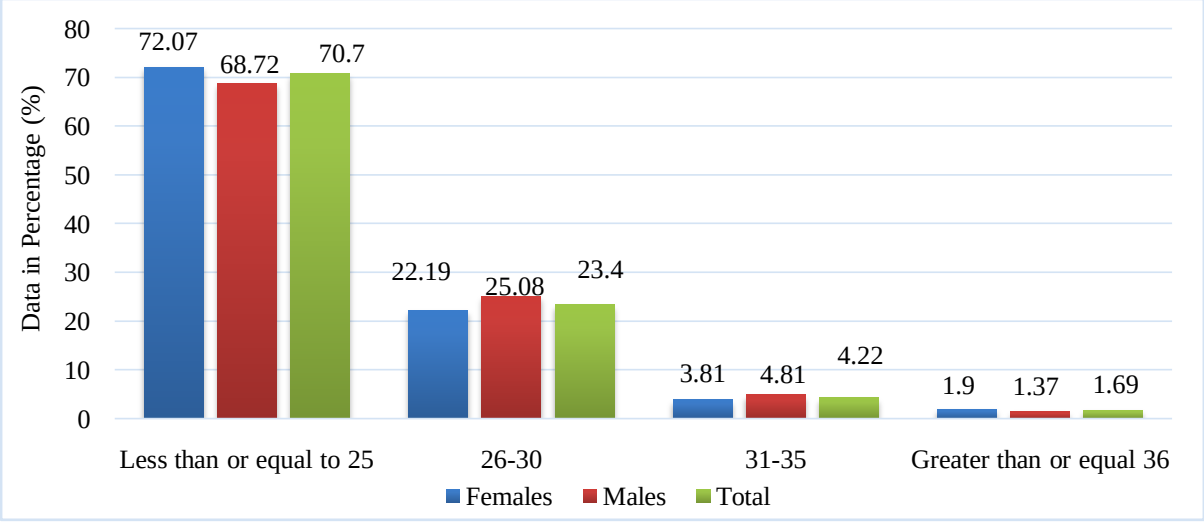
*** Independent t-test used, *p*- value =0.381**

**Table 3: Distribution of DAI components among study subjects by gender**

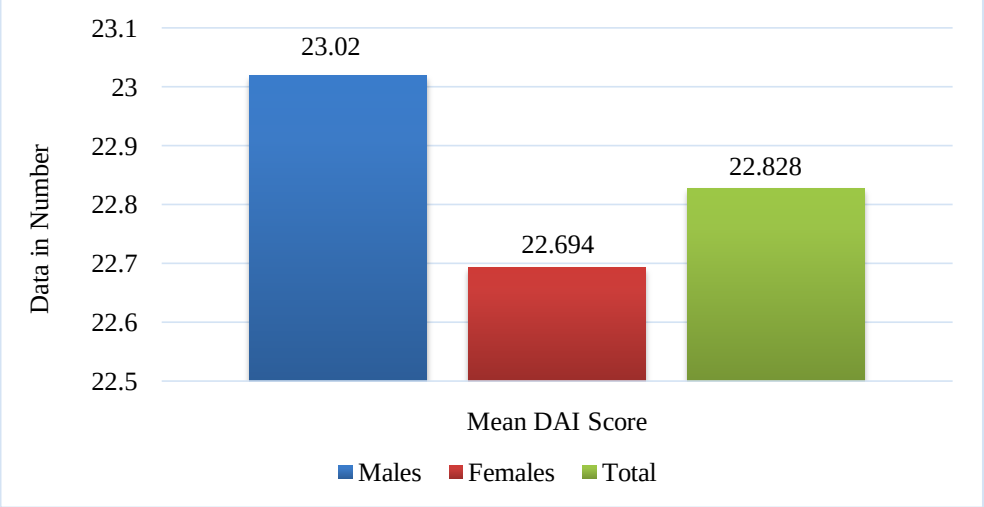
| DAI Components | Females *N= 419* *n (%)* | Males *N= 291* *n (%)* | Total *N= 710* *n (%)* | *p* – value |
|---|---|---|---|---|
| Missing anterior teeth (total) | 14 (3.34) | 4 (1.37) | 18 (2.53) | 0.154 |
| No teeth missing | 405 (96.66) | 287 (98.63) | 692 (97.47) | |
| One tooth missing | 10 (2.39) | 4 (1.37) | 14 (1.97) | |
| Two teeth missing | 4 (0.95) | 0 | 4 (0.56) | |
| Incisal segment crowding (total) | 195 (46.54) | 152 (52.23) | 347 (48.87) | 0.017* |
| No crowding | 224 (53.46) | 139 (47.77) | 363 (51.13) | |
| One segment | 114 (27.21) | 108 (37.11) | 222 (31.27) | |
| Two segment | 81 (19.33) | 44 (15.12) | 125 (17.60) | |
| Incisal segment spacing (total) | 58 (13.84) | 50 (17.18) | 108 (15.21) | 0.390 |
| No spacing | 361 (86.16) | 241 (82.82) | 602 (84.79) | |
| One segment | 48 (11.46) | 39 (13.40) | 87 (12.25) | |
| Two segment | 10 (2.39) | 11 (3.78) | 21 (2.96) | |
| Midline diastema (mm) (total) | 9 (2.19) | 16 (5.50) | 25 (3.52) | 0.122 |
| No diastema | 410 (97.85) | 275 (94.50) | 685 (96.48) | |
| 1 mm | 7 (1.67) | 10 (3.44) | 17 (2.4) | |
| 2 mm | 2 (0.48) | 5 (1.72) | 7 (0.98) | |
| 3 mm | 0 | 1 (0.34) | 1 (0.14) | |
| Largest anterior maxillary irregularity (mm) (total) | 140 (33.41) | 75 (25.77) | 215 (30.28) | 0.05* |
| No irregularity | 279 (66.59) | 216 (74.23) | 495 (69.72) | |
| 1-2 mm | 100 (23.87) | 62 (21.30) | 162 (22.82) | |
| ≥3 mm | 40 (9.54) | 13 (4.47) | 53 (7.46) | |
| Largest anterior mandibular irregularity (mm) (total) | 216 (51.55) | 163 (56.01) | 379 (53.38) | 0.66 |
| No irregularity | 203 (48.45) | 128 (43.99) | 331 (46.62) | |
| 1-2 mm | 203 (48.45) | 150 (51.54) | 353 (49.72) | |
| ≥3 mm | 13 (3.10) | 13 (4.47) | 26 (3.66) | |
| Anterior maxillary overjet (mm) | 383 (91.4) | 279 (95.88) | 662 (93.24) | 0.125 |
| 0 mm | 36 (8.59) | 12 (4.12) | 48 (6.76) | |
| 1 mm | 116 (27.68) | 69 (23.72) | 185 (26.05) | |
| 2-3 mm | 224 (53.46) | 171 (58.76) | 395 (55.64) | |
| ≥4 mm | 43 (10.26) | 39 (13.40) | 82 (11.55) | |
| Anterior mandibular overjet (mm) | 27 (6.44) | 15 (5.15) | 42 (5.92) | 0.760 |
| 0 mm | 392 (93.56) | 276 (94.85) | 668 (94.08) | |
| ≥1 mm | 27 (6.44) | 15 (5.15) | 42 (5.92) | |
| Vertical anterior openbite (mm) | 18 (4.30) | 8 (2.75) | 26 (3.66) | 0.083 |
| 0 mm | 401 (95.70) | 283 (97.25) | 684 (96.34) | |
| ≥1 mm | 18 (4.30) | 8 (2.75) | 26 (3.66) | |
| Anteroposterior molar relation (total: Half+full cusp) | 103 (24.58) | 79 (27.15) | 182 (25.63) | 0.311 |
| Normal | 316 (75.42) | 212 (72.85) | 528 (74.37) | |
| Half Cusp | 76 (18.11) | 59 (20.13) | 135 (19.01) | |
| Full Cusp | 27 (6.47) | 20 (7.02) | 47 (6.62) | |

Chi square test was used; * p- value ≤ 0.05 (Statistically significant)

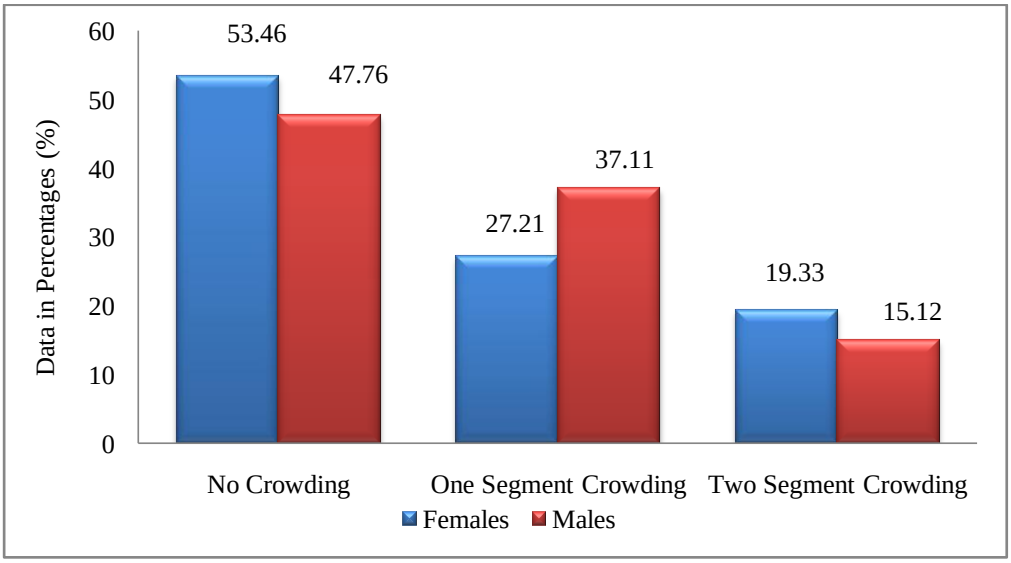
**Graph 1: Dental aesthetic index scores and orthodontic treatment needs among study subjects by gender**



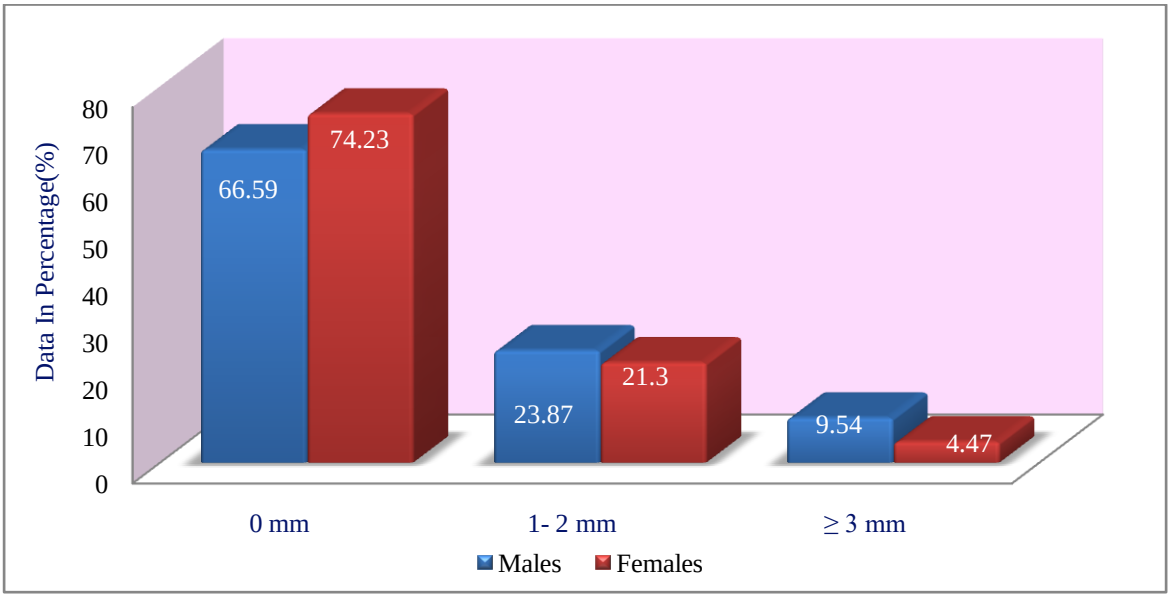
**Graph 2: Mean dental aesthetic index score among study subjects by gender**




**Graph 3: Distribution of Incisal segment crowding among study subjects by gender.**




**Graph 4: Distribution of Largest anterior maxillary irregularity among study subjects by gender**



## 4. Discussion

The present cross-sectional descriptive study was conducted to assess the prevalence of malocclusion and orthodontic treatment needs among 15 year old school going children of Davangere City, Karnataka using Dental Aesthetic Index (DAI).

In relation to dental anomalies, the number of missing permanent incisor, canine and premolar teeth in the upper and lower arches were recorded. The results are lesser in comparison to other studies. [1,17,18-22] Though, these results were similar to a study conducted in Davangere.[23]

In the present study, 48.87% of children had either one or two segment crowding. This prevalence is close to that reported for children in many similar studies.[20,24]The result was statistically significant between genders (p=0.017), with male participants showing greater one segment or two segment crowding when compared to that in females. It might be related to the fact that male growth starts later and does not reach maximum at the age range of the study population.

Incisal segment spacing was seen in 15.21% study participants. Like most communities,[20-22] the population studied in this research had more crowding than spacing.The presence of crowding and spacing in the dental arches may be due to dentoalveolar discrepancies, tooth size and jaw size discrepancies.[20]

In the present study, largest anterior maxillary irregularity was conferred in 30.28 % of the study subjects, which is comparatively lesser when compared to previous studies.[22, 24]Of particular interest was to note that females showed higher prevalence in this malocclusion trait (33.41%) compared to that in males (25.77%) and this difference was statistically significant (p=0.05). This result was in contrast to previous studies.[19,20,24]

The largest anterior mandibular irregularity showed prevalence of 53.38% in the study population, which is higher than the irregularity found in the upper arch (30.28%). This finding is in contrast to some previous studies.[20,25]

The predominant anteroposterior relationship of dental arches was normal (74.37%) in the present study sample. These findings showed higher prevalence of deviated anteroposterior molar relation from other studies.[18,20]

### 4.1 DAI score distribution

The mean DAI score was found to be 22.83 ± 4.85, which was similar to the scores obtained in other studies.[17,21,26] Males showed slightly higher mean DAI scores (23.02 ± 4.75) than females (22.69 ± 4.96), which concurs with other studies. [19,25] This generates a higher demand for orthodontic treatment among males than females. The reason for this is not understood, but it might be related to the fact that male growth starts later and does not reach maximum at the age range of the study population.

Orthodontic treatment need found in the study (29.3%) was similar with the needs assessed in previous studies. [24,27-29] It was an interesting finding that the orthodontic treatment need is quite higher when compared to previous studies conducted in similar conditions. [20, 23] This may be due to the fact that orthodontic concern is still given low priority in oral health-care in this area and there is an absence of planning of orthodontic care program.

## 5. Conclusion

The prevalence of malocclusion and orthodontic treatment needs among school children of Davangere, Karnataka, India was found to be 29.3% and a higher need of orthodontic treatment need was observed when compared to previous studies conducted at the same place. The systematic manoeuvre comprising of awareness, assessment and analysis can provide a guideline for optimal utilization of the available resources for the treatment of the masses thereby leading to uncompromised healthy smile for all.

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**Competing interest:** Nil

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