Abstract

In the present study, the prevalence of malocclusion and need for orthodontic treatment was assessed among 11-15 years old school children in Nagpur, India. This was a cross-sectional study that included 1050 subjects aged between 11-15 years. The demographic data of the subjects were recorded, and the Dental Aesthetic Index (DAI) was used to assess the malocclusion and orthodontic treatment needs. Chi-square test, one way ANOVA and Post Hoc Scheffe’s test and unpaired t test were used for statistical analysis. It was seen that 34.19% of the subjects reported with malocclusion and the need for orthodontic treatment. A significant age and gender difference exist among younger age group and a male inclination was noted. Our study showed crowding of anteriors, diastema and the largest irregularity in the anterior maxillary segment in males, when compared to females. The prevalence of malocclusion and orthodontic treatment needs in school going children of Nagpur, Maharashtra and India was 34.19%. The outcomes of the present study will aid clinicians formulating the treatment for children.

Key words: Dental Aesthetic Index, malocclusion, midline diastema, orthodontic treatment

Introduction

Malocclusion is considered as an abnormal occlusion in which teeth are not in a normal position in relation to adjacent teeth in the same jaw, and/or the opposing teeth when the jaws are closed. It is one amongst the highly prevalent oral pathologies, followed by tooth decay and periodontal disease and ranks third among world-wide dental public health precedence.

Cross bites (Class I malocclusion) are known to occur because of the initial position of the tooth buds and orofacial pressure that aid in eruption sequence of the teeth. Cross bite results in various implications such as psychosocial problems related to impaired dentofacial aesthetics, disturbances of oral function which includes mastication, swallowing and speech problems and greater susceptibility to trauma and periodontal disease. Previous studies have shown its impact on quality of life, which affects social and emotional well-being of the children.

The epidemiological data on orthodontic treatment need is required for dental public health programs,
clinical treatment, screening for treatment priority, resource planning and third-party funding. Assessment of distribution of malocclusion in childhood can help its prevention and thus reducing the complexity of costly orthodontic treatment.

Owing to the above-mentioned issues and paucity in the literature regarding malocclusion prevalence in this part of India, the present study was undertaken to assess the prevalence of malocclusion and orthodontic treatment needs in 11-15 years old school children in Nagpur, India.

Materials and methods
This was a cross-sectional survey conducted from March 2015 to February 2016, among 11-15 years old school children in Nagpur, India. The study was initiated after obtaining ethics committee approval of the institute.

Children with mixed dentition, craniofacial abnormalities, presence of clefts, syndromes affecting dentofacial structures, history of orofacial trauma, subjects presently undergoing or those who gave a history of previous orthodontic treatment were excluded.

A comprehensive search of schools in Nagpur was carried out, and a list of 179 schools was made (154 Private and 25 Government schools). A pilot study was carried out among 80 children from two schools (a private and a government) randomly selected from the prepared list to determine the sample size and feasibility of the main study. Depending upon the prevalence of malocclusion obtained (42%), the sample size for the present study was determined to be 1025 children (rounded off to 1050). The sample size was calculated using the formula \( N = \frac{Z^2 \times (P \times (1-P))}{E^2} \), with a margin of error of 5% and a confidence level of 95%. The sample size needed was achieved from five private and six government schools from Nagpur city, Central India.

Prior to the examination, written consent from parents and the governing bodies of the respective schools were obtained. The dental examination was performed under wide natural light. Disposable gloves, tongue blade, mouth mirror and a graduated periodontal probe were the instruments used for the study. The assessment of malocclusion was made according to the dental aesthetic index (DAI) as described by the WHO oral health survey. The examination was carried out by two investigators. The inter-examiner kappa value was 0.86 and intra-examiner kappa values for the two examiners were 0.91 and 0.89.

Statistical analysis
Descriptive statistics including computation of percentages, means and standard deviations were carried out in Microsoft excel 2010. The data was then exported to Statistical Package Social Sciences (SPSS) version 20 (SPSS Inc., Chicago, Illinois, USA) for comparative statistics.

The Chi-square test \( (\chi^2) \) was used for comparisons of malocclusion prevalence between different age and gender groups. One way ANOVA along with Post hoc Scheffe’s test was used for comparison of mean DAI scores between the various age groups and changes in DAI scores. \( t \)-test was used for comparing the mean DAI scores between gender groups.

Results
Distribution of study subjects: A total of 1050 children participated in the study, of which 593 (56.5%) were males and 457 (43.5%) were females. The age wise distribution of children age wise has been shown in Table 1.

Table 1: Distribution of children by age and gender

<table>
<thead>
<tr>
<th>Age (Years)</th>
<th>Gender n (%)</th>
<th>Total n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>11</td>
<td>112(10.66)</td>
<td>94(8.95)</td>
</tr>
<tr>
<td>12</td>
<td>109(10.38)</td>
<td>87(8.28)</td>
</tr>
<tr>
<td>13</td>
<td>134(12.76)</td>
<td>94(8.95)</td>
</tr>
<tr>
<td>14</td>
<td>126(12)</td>
<td>98(9.33)</td>
</tr>
<tr>
<td>15</td>
<td>112(10.57)</td>
<td>84(8.09)</td>
</tr>
<tr>
<td>Total</td>
<td>593(56.4)</td>
<td>457(43.6)</td>
</tr>
</tbody>
</table>

Distribution of DAI components by age and gender:
It was found that for incisal crowding, when compared with age, males showed greater prevalence of one segment (38.44%) and two segments
crowding (14.33%) than the females (one segment crowding – 17.8%, two segments crowding – 6.8%). A statistically significant association (P = 0.001) was noted between the two.

With respect to 1 mm, 2 mm and 3 mm diastema, a statistically significant gender difference was noted. The proportion of males with 1 mm (11.7%), 2 mm (6.4%) and 3 mm (3.5%) diastema was significantly higher than 1 mm (3.5%), 2 mm (1.8%), and 3 mm (1.4%) in females. (P<0.05).

More than 50% of the children (53.52%) did not show any maxillary irregularity. However, 5.33% of the children showed largest anterior maxillary irregularity of ≥3 mm.

A waning pattern of irregularity from 12 years towards 15 years was noted, which showed statistical significance (P<0.05). About 1-2 mm and ≥ 3 mm maxillary irregularity was seen in males (47.8% and 4.9%) than in females (32.6% and 5.8%). (P = 0.00).

Mandibular irregularity was seen in one-fourth of the subjects, with 25.14% and 1.8% children falling in groups of 1-2 mm and ≥ 3 mm anterior mandibular irregularities.

Anterior maxillary overjet between 2 mm and 3 mm was seen in 46.8 and 50.4% of the children, however, only 2.85% of them reported to have anterior mandibular overjet. It was seen that 3.04% of them had open bite. Over 86.66% had normal molar relation, 7.52% had half cusp deviation and 5.80% had full cusp deviation. (Table 2, 3)

Table 2: DAI scores and orthodontic treatment needs among study subjects by gender

<table>
<thead>
<tr>
<th>DAI components</th>
<th>Males (593)</th>
<th>Females (457)</th>
<th>Total (1050)</th>
<th>P value (Chi-Square test)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Missing anterior teeth (total)</td>
<td>51(8.6)</td>
<td>38(8.31)</td>
<td>89(8.47)</td>
<td>0.374</td>
</tr>
<tr>
<td>No teeth missing</td>
<td>542(91.4)</td>
<td>419(91.68)</td>
<td>961(91.52)</td>
<td></td>
</tr>
<tr>
<td>1 teeth missing</td>
<td>12(2.02)</td>
<td>12(2.62)</td>
<td>24(2.28)</td>
<td></td>
</tr>
<tr>
<td>2 teeth missing</td>
<td>37(6.23)</td>
<td>26(5.68)</td>
<td>63(6)</td>
<td></td>
</tr>
<tr>
<td>3 teeth missing</td>
<td>2(0.33)</td>
<td>0(0)</td>
<td>2(0.19)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Incisor crowding</th>
<th>Males (593)</th>
<th>Females (457)</th>
<th>Total (1050)</th>
<th>P value (Chi-Square test)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No crowding</td>
<td>313(52.8)</td>
<td>112(24.6)</td>
<td>425(40.47)</td>
<td></td>
</tr>
<tr>
<td>1 segment crowding</td>
<td>280(47.21)</td>
<td>345(75.49)</td>
<td>625(59.52)</td>
<td></td>
</tr>
<tr>
<td>2 segment crowding</td>
<td>228(38.44)</td>
<td>81(17.8)</td>
<td>309(29.42)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Incisor spacing</th>
<th>Males (593)</th>
<th>Females (457)</th>
<th>Total (1050)</th>
<th>P value (Chi-Square test)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No spacing</td>
<td>193(32.5)</td>
<td>465(77.88)</td>
<td>658(62.37)</td>
<td></td>
</tr>
<tr>
<td>1 segment spacing</td>
<td>280(47.21)</td>
<td>345(75.49)</td>
<td>625(59.52)</td>
<td></td>
</tr>
<tr>
<td>2 segment spacing</td>
<td>309(51.8)</td>
<td>741(70.57)</td>
<td>1050(97.14)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Midline diastema(mm)</th>
<th>Males (593)</th>
<th>Females (457)</th>
<th>Total (1050)</th>
<th>P value (Chi-Square test)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absent</td>
<td>128(21.6)</td>
<td>31(6.7)</td>
<td>159(15.14)</td>
<td></td>
</tr>
<tr>
<td>1 mm</td>
<td>71(11.7)</td>
<td>16(3.5)</td>
<td>87(8.28)</td>
<td></td>
</tr>
<tr>
<td>2 mm</td>
<td>88(14.8)</td>
<td>8(1.8)</td>
<td>96(8.28)</td>
<td></td>
</tr>
<tr>
<td>3 mm</td>
<td>10(1.7)</td>
<td>7(1.4)</td>
<td>17(1.6)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Upper anterior irregularity</th>
<th>Males (593)</th>
<th>Females (457)</th>
<th>Total (1050)</th>
<th>P value (Chi-Square test)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Irregularity</td>
<td>313(52.7)</td>
<td>175(38.4)</td>
<td>488(46.47)</td>
<td></td>
</tr>
<tr>
<td>1-2 mm</td>
<td>280(47.21)</td>
<td>282(61.70)</td>
<td>562(53.52)</td>
<td></td>
</tr>
<tr>
<td>≥3 mm</td>
<td>283(47.5)</td>
<td>149(32.6)</td>
<td>432(40.47)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lower anterior irregularity</th>
<th>Males (593)</th>
<th>Females (457)</th>
<th>Total (1050)</th>
<th>P value (Chi-Square test)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Irregularity</td>
<td>171(28.9)</td>
<td>112(24.6)</td>
<td>283(26.95)</td>
<td></td>
</tr>
<tr>
<td>1-2 mm</td>
<td>150(25.8)</td>
<td>105(23.06)</td>
<td>255(24.14)</td>
<td></td>
</tr>
<tr>
<td>≥3 mm</td>
<td>12(2.1)</td>
<td>7(1.54)</td>
<td>19(1.80)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Maxillary overjet</th>
<th>Males (593)</th>
<th>Females (457)</th>
<th>Total (1050)</th>
<th>P value (Chi-Square test)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 mm</td>
<td>12(2.1)</td>
<td>9(1.9)</td>
<td>21(2.0)</td>
<td></td>
</tr>
<tr>
<td>1 mm</td>
<td>210(35.4)</td>
<td>155(34.0)</td>
<td>365(34.76)</td>
<td></td>
</tr>
<tr>
<td>2-3 mm</td>
<td>277(46.8)</td>
<td>230(50.4)</td>
<td>507(48.28)</td>
<td></td>
</tr>
<tr>
<td>≥4 mm</td>
<td>93(15.7)</td>
<td>69(15.7)</td>
<td>162(15.39)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mandibular overjet</th>
<th>Males (593)</th>
<th>Females (457)</th>
<th>Total (1050)</th>
<th>P value (Chi-Square test)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 mm</td>
<td>573(96.6)</td>
<td>447(97.8)</td>
<td>1020(97.14)</td>
<td>0.284</td>
</tr>
<tr>
<td>≥1mm</td>
<td>20(3.4)</td>
<td>10(2.2)</td>
<td>30(2.85)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Open bite</th>
<th>Males (593)</th>
<th>Females (457)</th>
<th>Total (1050)</th>
<th>P value (Chi-Square test)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 mm</td>
<td>578(97.4)</td>
<td>440(96.2)</td>
<td>1018(96.95)</td>
<td></td>
</tr>
<tr>
<td>≥1 mm</td>
<td>15(2.6)</td>
<td>17(3.8)</td>
<td>32(3.04)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Molar relation</th>
<th>Males (593)</th>
<th>Females (457)</th>
<th>Total (1050)</th>
<th>P value (Chi-Square test)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>512(86.4)</td>
<td>398(87.1)</td>
<td>910(86.60)</td>
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</tr>
<tr>
<td>Half cusp</td>
<td>47(7.9)</td>
<td>32(6.9)</td>
<td>79(7.32)</td>
<td></td>
</tr>
<tr>
<td>Full cusp</td>
<td>34(5.7)</td>
<td>27(6)</td>
<td>61(5.80)</td>
<td></td>
</tr>
</tbody>
</table>

Table 2: DAI scores and orthodontic treatment needs among study subjects by gender
### Table 3: Distribution of DAI components among study subjects by age

<table>
<thead>
<tr>
<th>DAI components</th>
<th>11 years N=206(%)</th>
<th>12 years N=196(%)</th>
<th>13 years N=228(%)</th>
<th>14 years N=224(%)</th>
<th>15 years N=196(%)</th>
<th>Total (1050)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Missing anterior teeth (total)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.061</td>
</tr>
<tr>
<td>No teeth missing</td>
<td>15(7.44)</td>
<td>16(8.25)</td>
<td>17(7.52)</td>
<td>18(8.14)</td>
<td>23(11.76)</td>
<td>89(4.87)</td>
<td></td>
</tr>
<tr>
<td>1 tooth missing</td>
<td>191(92.71)</td>
<td>180(91.83)</td>
<td>211(92.54)</td>
<td>206(91.96)</td>
<td>173(88.26)</td>
<td>961(91.52)</td>
<td>0.02*</td>
</tr>
<tr>
<td>2 teeth missing</td>
<td>4(1.86)</td>
<td>3(1.53)</td>
<td>4(1.76)</td>
<td>6(2.67)</td>
<td>10(5.10)</td>
<td>24(2.28)</td>
<td></td>
</tr>
<tr>
<td>3 teeth missing</td>
<td>11(5.88)</td>
<td>12(6.12)</td>
<td>15(5.70)</td>
<td>14(6.11)</td>
<td>13(6.63)</td>
<td>63(6.50)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1(0.45)</td>
<td>0</td>
<td>2(0.19)</td>
<td></td>
</tr>
<tr>
<td>Incisor crowding</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No crowding</td>
<td>123(77.29)</td>
<td>96(44.68)</td>
<td>74(32.45)</td>
<td>82(37.10)</td>
<td>50(29.31)</td>
<td>425(40.47)</td>
<td></td>
</tr>
<tr>
<td>1 segment crowding</td>
<td>85(40.99)</td>
<td>100(51.02)</td>
<td>154(67.54)</td>
<td>142(63.39)</td>
<td>162(85.99)</td>
<td>625(59.52)</td>
<td></td>
</tr>
<tr>
<td>2 segment crowding</td>
<td>27(13.38)</td>
<td>68(34.69)</td>
<td>25(11.75)</td>
<td>61(27.23)</td>
<td>36(18.38)</td>
<td>305(29.42)</td>
<td></td>
</tr>
<tr>
<td>Midline diastema(mm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.274</td>
</tr>
<tr>
<td>Absent</td>
<td>31(15.04)</td>
<td>34(17.34)</td>
<td>26(11.40)</td>
<td>28(12.50)</td>
<td>41(20.91)</td>
<td>159(15.14)</td>
<td></td>
</tr>
<tr>
<td>1 mm</td>
<td>178(88.45)</td>
<td>162(82.65)</td>
<td>202(88.59)</td>
<td>196(87.5)</td>
<td>157(79.08)</td>
<td>891(84.85)</td>
<td></td>
</tr>
<tr>
<td>2 mm</td>
<td>12(5.88)</td>
<td>10(5.10)</td>
<td>9(3.94)</td>
<td>10(4.46)</td>
<td>12(6.12)</td>
<td>46(4.38)</td>
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</tr>
<tr>
<td>3 mm</td>
<td>3(1.49)</td>
<td>4(1.94)</td>
<td>6(2.67)</td>
<td>8(4.08)</td>
<td>8(4.08)</td>
<td>20(2.87)</td>
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</tr>
<tr>
<td>Upper anterior irregularity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.196</td>
</tr>
<tr>
<td>No irregularity</td>
<td>107(53.94)</td>
<td>90(45.40)</td>
<td>91(39.91)</td>
<td>97(43.30)</td>
<td>104(53.06)</td>
<td>488(46.47)</td>
<td></td>
</tr>
<tr>
<td>1-2 mm</td>
<td>99(48.05)</td>
<td>107(54.59)</td>
<td>137(60.08)</td>
<td>127(56.69)</td>
<td>92(46.93)</td>
<td>562(53.52)</td>
<td></td>
</tr>
<tr>
<td>≥3 mm</td>
<td>95(46.11)</td>
<td>78(39.79)</td>
<td>81(35.52)</td>
<td>84(37.50)</td>
<td>94(47.95)</td>
<td>442(41.14)</td>
<td></td>
</tr>
<tr>
<td>Lower anterior irregularity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.01*</td>
</tr>
<tr>
<td>No irregularity</td>
<td>150(72.81)</td>
<td>144(73.46)</td>
<td>160(74.12)</td>
<td>164(73.21)</td>
<td>140(71.42)</td>
<td>767(73.04)</td>
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</tr>
<tr>
<td>1-2 mm</td>
<td>52(25.24)</td>
<td>49(25)</td>
<td>56(24.56)</td>
<td>54(24.10)</td>
<td>53(27.04)</td>
<td>264(25.14)</td>
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</tr>
<tr>
<td>≥3 mm</td>
<td>4(1.94)</td>
<td>3(1.53)</td>
<td>3(1.31)</td>
<td>6(2.67)</td>
<td>3(1.53)</td>
<td>19(1.80)</td>
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</tr>
<tr>
<td>Maxillary overjet</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.256</td>
</tr>
<tr>
<td>0 mm</td>
<td>3(1.45)</td>
<td>5(2.55)</td>
<td>6(2.63)</td>
<td>3(1.33)</td>
<td>4(2.04)</td>
<td>21(2.0)</td>
<td></td>
</tr>
<tr>
<td>1 mm</td>
<td>72(34.95)</td>
<td>64(32.69)</td>
<td>79(34.64)</td>
<td>76(33.92)</td>
<td>70(35.71)</td>
<td>365(34.76)</td>
<td></td>
</tr>
<tr>
<td>2-3 mm</td>
<td>98(47.08)</td>
<td>96(48.92)</td>
<td>111(48.68)</td>
<td>107(47.76)</td>
<td>94(47.95)</td>
<td>507(48.28)</td>
<td></td>
</tr>
<tr>
<td>≥4mm</td>
<td>53(26.50)</td>
<td>25(12.75)</td>
<td>32(14.03)</td>
<td>38(16.96)</td>
<td>28(12.85)</td>
<td>150(14.85)</td>
<td></td>
</tr>
<tr>
<td>Mandibular overjet</td>
<td></td>
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<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>0 mm</td>
<td>200(97.08)</td>
<td>193(98.46)</td>
<td>219(96.05)</td>
<td>217(96.87)</td>
<td>191(97.44)</td>
<td>1020(97.14)</td>
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</tr>
<tr>
<td>≥1 mm</td>
<td>6(2.92)</td>
<td>3(1.53)</td>
<td>9(3.94)</td>
<td>7(3.12)</td>
<td>5(2.55)</td>
<td>30(2.85)</td>
<td></td>
</tr>
<tr>
<td>Open bite</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.369</td>
</tr>
<tr>
<td>0 mm</td>
<td>200(97.08)</td>
<td>192(97.95)</td>
<td>218(95.61)</td>
<td>216(96.42)</td>
<td>192(97.95)</td>
<td>1018(96.95)</td>
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</tr>
<tr>
<td>≥1 mm</td>
<td>6(2.92)</td>
<td>2(0.48)</td>
<td>10(4.38)</td>
<td>8(3.57)</td>
<td>4(2.04)</td>
<td>32(3.04)</td>
<td></td>
</tr>
<tr>
<td>Molar relation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.169</td>
</tr>
<tr>
<td>Normal</td>
<td>178(86.40)</td>
<td>174(88.77)</td>
<td>192(84.21)</td>
<td>192(85.71)</td>
<td>174(88.77)</td>
<td>916(86.66)</td>
<td></td>
</tr>
<tr>
<td>Half cusp</td>
<td>16(7.76)</td>
<td>15(6.63)</td>
<td>19(8.33)</td>
<td>17(7.58)</td>
<td>14(7.14)</td>
<td>79(7.52)</td>
<td></td>
</tr>
<tr>
<td>Full cusp</td>
<td>12(5.82)</td>
<td>9(4.59)</td>
<td>17(7.45)</td>
<td>15(6.69)</td>
<td>8(4.08)</td>
<td>61(5.80)</td>
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</tr>
</tbody>
</table>

Distribution of DAI scores by age and gender

The mean DAI score of the subjects reduced significantly by age (P = 0.00) with a score of 21.22±4.62, 20.57±4.66, 19.74±4.43, 20.06±4.63 and 18.16±4.89 among 11, 12, 13, 14, and 15 years age group, respectively. (Table 4)

### Table 4: Distribution of DAI scores by age and gender

<table>
<thead>
<tr>
<th>Age (Years)</th>
<th>Gender n (%)</th>
<th>Mean dental aesthetic score ±SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>M - 112(56.6)</td>
<td>21.46±4.86</td>
</tr>
<tr>
<td></td>
<td>F - 94(43.4)</td>
<td>22.37±4.09</td>
</tr>
<tr>
<td></td>
<td>T - 206(100)</td>
<td>21.22±4.62</td>
</tr>
</tbody>
</table>
Atulkar M, et al: Malocclusion and orthodontic treatment needs in school children

### Table 5: DAI score and orthodontic treatment needs

<table>
<thead>
<tr>
<th>Age (Years)</th>
<th>Gender n (%)</th>
<th>Mean dental aesthetic score ±SD</th>
<th>DAI score and orthodontic treatment needs n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>No abnormality or minor malocclusion</td>
</tr>
<tr>
<td>11</td>
<td>M - 112(10.66)</td>
<td>F - 94(8.05)</td>
<td>T - 206(19.61)</td>
</tr>
<tr>
<td></td>
<td>M - 109(10.38)</td>
<td>F - 87(8.28)</td>
<td>T - 196(18.66)</td>
</tr>
<tr>
<td></td>
<td>M - 134(12.76)</td>
<td>F - 98(9.33)</td>
<td>T - 228(21.71)</td>
</tr>
<tr>
<td>14</td>
<td>M - 126(12)</td>
<td>F - 98(9.33)</td>
<td>T - 224(21.71)</td>
</tr>
<tr>
<td>15</td>
<td>M - 112(10.57)</td>
<td>F - 84(8.09)</td>
<td>T - 196(21.71)</td>
</tr>
</tbody>
</table>

A significant difference in the DAI score and orthodontic treatment needs was noted. Among the study population. It was noticed that 34.19% subjects had malocclusion and required orthodontic treatment. Age wise distribution showed a statistically significant decrease ($P = 0.03$) in the severity of DAI score in the 11–15 years age group. Significant variance ($P = 0.00$) by gender when determined, and it showed a higher percentage (30.18%) of male children having definite malocclusion which require elective treatment, 5.73% of them having severe malocclusion and 1.68% having severe or handicapping malocclusion requiring mandatory orthodontic treatment than the female subjects. Of the subjects, 28% of them required elective treatment, 41.42% of them required mandatory orthodontic treatment needs.

Table 5 shows the DAI score and orthodontic treatment needs among the studied population.
Discussion

Prevalence of malocclusion was assessed in many parts of India, including northern states of Rajasthan, Himachal Pradesh, Gujarat and southern states of Telangana, Karnataka and Kerala. Owing to the paucity in literature, the present cross-sectional study was conducted in Nagpur, Central India, to assess the prevalence of malocclusion and orthodontic treatment needs among 11-15 years old school going children.

The prevalence of malocclusion in our study is lower to the study done by Kaur et al. in Karnataka, India (87.79%). Roopesh R in south Calicut and Trehan et al. in Jaipur (66.7%) who reported a lower prevalence than the present study and in favour to the study by Singh S et al. in Naggar, Himachal Pradesh (34.5%) and Sandhya et al. in Gujarat (33.4%).

In the present study, maxillary overjet less than 3 mm was found to be 48.28% of the subjects, which was more as compared to the findings of Siddegowda and Rani in Karnataka (6.3%) and lower than the findings of Hemapriya et al. in Kancheepuram, India (61.4%).

In our study, only 3.04% of the subjects reported with anterior open bite, which is quite more than the findings of Farahani et al. in Iran (1.6%) and Mtaya et al. in Tanzania (1.8%). Whereas, the findings of our study were lower than the findings of Ajayi in Nigeria (4.1%) and Poeung et al. in Cambodia (16.4%).

Among the total subjects evaluated, 4.38% were with maxillary midline diastema of at least 2mm. This finding is very lower when compared with the studies by Hemapriya et al. in Kancheepuram (35.2%), India and Ajayi in Nigeria (19.5%).

Within the limitations of the study, the findings of the present study will be beneficial for the early interceptive measures as well as early correction of the malocclusion, thus reducing its severity in the permanent dentition. Further longitudinal studies are required to clarify the findings and to provide accurate estimates of the orthodontic treatment need. There is also a need to inculcate the orthodontic services in the current public health policies to fill the lacunae. A sustained effort of the public private collaboration resulting in a creative synergy capitalizing on the talent and resources of each partner can have a beneficial role.

Conclusion

The prevalence of malocclusion and orthodontic treatment needs among school children of Nagpur, Maharashtra, India was found to be 34.19%. The prevalence was greater among older than younger children and also among males than females. The present study provides a reference information to strengthen the implementation of school-based oral health promotion programs. In order to meet the orthodontic treatment needs, the Public Health Dentistry and orthodontic departments of dental colleges should undertake imperative steps in the initiation and implementation of a comprehensive agenda.

References

6. Bernabé E, Flores-Mir C, Sheiham A. Prevalence, intensity and extent of oral impacts on daily performances associated with self-perceived


