Assessment of Malocclusion and Orthodontic Treatment Needs among Subjects with Dental Aesthetic Index: A Clinical Study

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Background: Malocclusion is commonly seen condition in young adults. This study aimed to assess malocclusion and orthodontic treatment needs among subjects with dental aesthetic index (DAI).

Materials and Methods: This study comprised 486 subjects with an age range of 16–24 years of either genders. A careful oral examination was performed and all findings were recorded based on Oral Health Survey—Basic Methods. DAI was used to assess orthodontic treatment needs among subjects.

Results: A maximum of 129 (26.5%) patients (male, 47 [22.8%], female, 82 [29.2%]) had DAI score of >36. Missing teeth was the most commonly observed condition, especially in females. There was a significant difference in spacing, crowding, maxillary, mandibular irregularity, overjet, and spacing between both genders.

Conclusion: It was found that maximum patients had severe malocclusion with DAI score >36. This indicates the orthodontic treatment needs among subjects.

Keywords: Dental aesthetic index, malocclusion, spacing

INTRODUCTION

Malocclusion is frequently encountered condition among population. It is defined as mal-relation of arches in planes such as sagittal, coronal, and axial.[1] In normal occlusion, there is harmony between teeth and arches.[2] Malocclusion can be skeletal or dental. Skeletal malocclusion is when there is disharmony between maxillary and mandibular arches.[3] Dental malocclusion is categorized based on the relation of maxillary first molar with mandibular first molar into class I, II, and III. Mesiobuccal cusp of maxillary first molar lies in mesiobuccal groove of mandibular first molar in class I malocclusion. When distobuccal cusp of maxillary first molar falls in mesiobuccal groove of mandibular first molar, it is known as class II malocclusion.[4] Class III malocclusion is when mesiobuccal cusp of maxillary first molar lies between mandibular first and second molar. Among all, Class II malocclusion is commonly seen.[5] Various modifications such as Dewey’s is routinely used in assessing malocclusion. On the basis of proclination or retroclination of maxillary incisors, class II malocclusion is categorized as div I and div II. Class II div I is when there is proclination of maxillary central and lateral incisors, whereas in Class II div I, either central or lateral incisors are retroclined (lingually inclined). Tipping, rotation, crowding, and so on, are commonly seen in anterior teeth.[6]

It has been observed that genetic and environmental factors or a combination of both is the major cause of malocclusion among patients. Local factors such as adverse or deleterious oral habits and alterations in tooth shape, their number, and position in the arches play an important role.[7] Aesthetic is the concern for which patients visit the dentist. Patients with dental or skeletal malocclusion are more prone to develop periodontal breakdown, dental caries, and temporomandibular joint disorders.[8] Considering this,
this study aimed to evaluate the type of malocclusion and the treatment needs among patients with dental aesthetic index (DAI).

**Materials and Methods**

This study comprised 486 subjects with an age range of 16–24 years of either genders. The consent of subjects was obtained after explaining the need of the study and their vernacular language.

Subjects who gave their consent within age range of 14–24 years were selected. Exclusion criteria for the study were subjects with previous history of orthodontic treatment, subjects with any structural abnormality in the teeth, and subjects who did not give their consent.

Demographic data were recorded in case record file. A careful oral examination was performed and all findings were recorded based on World Health Organization’s (WHO) Oral Health Survey—Basic Methods. Orthodontic treatment needs were determined using DAI.

Results thus obtained were compiled and entered in MS Excel sheet for statistics using Statistical Package for the Social Sciences (SPSS) software, version 26.0 (IBM, Chicago, Illinois). Orthodontic treatment needs among subjects were assessed with the help of chi-square test. The level of significance was 0.05.

**Results**

Table 1 shows age and gender distribution of subjects, which showed that maximum subjects were seen in the age-group 16–18 years (43.2%) with 90 (43.6%) male and 120 (42.8%) female.

Table 2 shows that a maximum of 129 patients (26.5%) (male, 47 [22.8%], female, 82 [29.2%]) had DAI score of >36. Statistically, the difference was nonsignificant ($P > 0.05$).

Table 3 shows that missing teeth using DAI $>1$ was seen in 146 male and 200 female. Spacing of $>2$ mm was seen in 62 subjects (54 male and 8 female), two teeth crowding was observed in 40 subjects (36 male and 4 female), diastema $>1$ mm was observed in 240 subjects (110 male and 130 female), mandibular irregularity $>2$ mm was seen in 68 subjects (26 male and 42 female), maxillary irregularity $>2$ mm was seen in 162 subjects (72 male and 90 female). A maximum of 120 male and 182 female had maxillary overjet of $0–2$ mm, mandibular overjet of $0–2$ mm was seen in 190 male and 246 female, and open bite $>2$ mm was observed in 35 male and 62 female. Molar relation full cusp was observed in 20 male and 48 female. Statistically, the difference was significant ($P < 0.05$).

**Discussion**

Dental malocclusion is frequently seen in young adults. Spacing, missing, crowding, rotation, midline diastema, and tipping are common conditions. Malocclusion is found to be one of the common dental diseases in children and young adults. Developing countries such as India face many challenges in rendering oral health care as the major population has rural background where oral health programs and preventive measures are far from satisfying needs. This study assessed malocclusion and orthodontic treatment need among subjects age ranged 16–24 years of both genders.

We found that age-group of 16–18 years had 210 (43.2%) subjects with 90 (43.6%) male and 120 (42.8%) female, 19–21 years had 156 (32%) subjects with 70 (33.9%) male and 86 (30.7%) female, and 22–24 years had 120 (24.6%) subjects with 46 (22.3%) male and 82 (29.2%) female.

In their study, Rekhi et al. included 352 male and 308 female (660) in an age range of 16–24 years and assessed the severity of the malocclusion and orthodontic treatment needs. The mean DAI score was 31.08 $\pm$ 7.98. Author reported no gender-wise difference. Different age-groups revealed statistically significant differences. Diastema between males and females was the only component where differences were found to be statistically significant.

We observed that a maximum of 129 (26.5%) patients (male, 47 [22.8%], female, 82 [29.2%]) had DAI score $>2$ mm was observed in 119 (24.4%) subjects with 55 (26.6%) male and 64 (22.8%) female, DAI score of $26–30$ was seen in 126 (25.9%) subjects with 56 (27.1%) male and 70 (25%) female, and DAI score of $31–35$ was observed in 112 (23%) subjects with 48 (23.3%) male and 64 (22.8%) female. The mean DAI was 32.06.

| Age group (years) | Male   | Female  | Total  |
|-------------------|--------|---------|--------|
| 16–18             | 90 (43.6%) | 120 (42.8%) | 210 (43.2%) |
| 19–21             | 70 (33.9%) | 86 (30.7%) | 156 (32%) |
| 22–24             | 46 (22.3%) | 74 (26.4%) | 120 (24.6%) |
| Total             | 206 (42.3%) | 280 (57.7%) | 486 (100%) |
Table 2: Distribution of subjects based on dental aesthetic index

| DAI  | Male       | Female     | Total         | P value |
|------|------------|------------|---------------|---------|
| <25  | 55 (26.6%) | 64 (22.8%) | 119 (24.4%)   | >0.05   |
| 26–30| 56 (27.1%) | 70 (25%)   | 126 (25.9%)   |         |
| 31–35| 48 (23.3%) | 64 (22.8%) | 112 (23%)     |         |
| >36  | 47 (22.8%) | 82 (29.2%) | 129 (26.5%)   |         |
| Total| 206 (42.3%)| 280 (57.7%)| 486 (100%)    |         |

Table 3: Dental aesthetic index characteristics

| DAI                          | Male       | Female     | Total | P value |
|------------------------------|------------|------------|-------|---------|
| Missing                      |            |            |       |         |
| 0                            | 60         | 80         | 140   | 0.01    |
| >1                           | 146        | 200        | 346   |         |
| Spacing (mm)                 |            |            |       |         |
| 0                            | 131        | 219        | 350   | 0.001   |
| 1                            | 21         | 53         | 74    |         |
| 2                            | 54         | 8          | 62    |         |
| Crowding                     |            |            |       |         |
| 0                            | 122        | 180        | 302   | 0.02    |
| 1                            | 48         | 96         | 144   |         |
| 2                            | 36         | 4          | 40    |         |
| Diastema (mm)                |            |            |       |         |
| 0                            | 96         | 150        | 246   | 0.12    |
| >1                           | 110        | 130        | 240   |         |
| Mandibular irregularity (mm) |            |            |       |         |
| 0–2                          | 180        | 238        | 412   | 0.001   |
| >2                           | 26         | 42         | 68    |         |
| Maxillary irregularity (mm)  |            |            |       |         |
| 0–2                          | 134        | 196        | 324   | 0.05    |
| >2                           | 72         | 90         | 162   |         |
| Maxillary overjet (mm)       |            |            |       |         |
| 0–2                          | 120        | 182        | 302   | 0.02    |
| >2                           | 86         | 98         | 184   |         |
| Mandibular overjet (mm)      |            |            |       |         |
| 0–2                          | 190        | 246        | 436   | 0.001   |
| >2                           | 16         | 34         | 50    |         |
| Open bite (mm)               |            |            |       |         |
| 0                            | 171        | 218        | 389   | 0.01    |
| >2                           | 35         | 62         | 97    |         |
| Molar relation               |            |            |       |         |
| Normal (0)                   | 112        | 152        | 264   | 0.05    |
| Half cusp (1)                | 76         | 80         | 156   |         |
| Full cusp (2)                | 20         | 48         | 68    |         |

Raina et al.\textsuperscript{(13)} evaluated cases of malocclusion and orthodontic treatment needs among the subjects aged 13–15 years. Prevalence of malocclusion was found to be 32.5%. The mean DAI score was 24.81 seen in 14-year-old subjects, whereas 13-year-old subjects had a score of 24.42 and 15-year-olds had 23.70, the difference was statistically significant ($P < 0.05$).

In our study, we observed that missing teeth using DAI >1 was seen in 146 male and 200 female, spacing of >2 mm was seen in 54 male and 8 female, two-teeth crowding was observed in 36 male and 4 female, diastema >1 mm was observed in 110 male and 130 female, mandibular irregularity >2 mm was seen in 26 male and 42 female, and maxillary irregularity >2 mm was seen in 72 male and 90 female. A maximum of 120 male and 182 female had maxillary overjet of 0–2 mm, mandibular overjet of 0–2 mm was seen in 190 male and 246 female, and open bite >2 mm was observed in 35 male and 62 female. We found that normal molar relation was seen in 112 male and 152 female, molar relation half cusp was seen in 76 male and 80 female, and molar relation full cusp was observed in
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20 male and 48 female. The difference was found to be significant ($P < 0.05$).

The DAI is a routinely used diagnostic tool that helps identify orthodontic treatment needs. It is accepted by World Health Organization (WHO), which measures 10 intraoral traits, which comprised missing teeth such as incisor, canine, premolar; maxillary and mandibular teeth crowding in incisal segments; maxillary and mandibular spacing in incisal segments; midline diastema; anterior maxillary and mandibular irregularity; anterior maxillary and mandibular overjet; anterior open bite; and anteroposterior molar relationship.[14] Treatment is considered mandatory in subjects having DAI score 36 (very severe malocclusion) and treatment is highly desirable in subjects having score 31–35 (severe malocclusion) whereas only elective treatment is indicated for subjects with score 26–30 (definite malocclusion).[15] In this study, we observed that DAI score of $>36$ was seen in 129 (26.5%) subjects that comprised 47 (22.8%) male and 82 (29.2%) female.

The limitation of the study was the small sample size.

**Conclusion**

It was found that maximum patients had severe malocclusion with DAI $>36$. This indicates orthodontic treatment needs among subjects.

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Nil.

**Conflicts of interest**

There are no conflicts of interest.

**References**

1. Firestone AR, Beck FM, Beglin FM, Vig KW. Validity of the index of complexity, outcome, and need (ICON) in determining orthodontic treatment need. Angle Orthod 2002;72:15-20.
2. Bellot-Arcis C, Montiel-Company JM, Almerich-Silla JM, Paredes-Gallardo V, Gandia-Franco JL. The use of occlusal indices in high-impact literature. Community Dent Health 2012;29:45-8.
3. Bernabé E, Flores-Mir C. Orthodontic treatment need in Peruvian young adults evaluated through dental aesthetic index. Angle Orthod 2006;76:417-21.
4. Al-Huwaizi AF, Rasheed TA. Assessment of orthodontic treatment needs of Iraqi Kurdish teenagers using the dental aesthetic index. East Mediterr Health J 2009;15:1535-41.
5. Brook PH, Shaw WC. The development of an index of orthodontic treatment priority. Eur J Orthod 1989;11:309-20.
6. Perez MA, Neira A, Alfaro J, Aguilera J, Alvear P, Fierro C. Orthodontic treatment needs according to the dental aesthetic index in 12-year-old adolescents, Chile. Rev Fac Odontol Univ Antioq 2014;26:33-43.
7. Baca-Garcia A, Bravo M, Baca P, Baca A, Junco P. Malocclusions and orthodontic treatment needs in a group of Spanish adolescents using the dental aesthetic index. Int Dent J 2004;54:138-42.
8. Hassan R, Rahimah AK. Occlusion, malocclusion and method of measurements: an overview. Arch Orofac Sci 2007;2:3-9.
9. Nainani JT, Relan S. Prevalence of malocclusion in school children of Nagpur rural region—an epidemiological study. JDI Ara 2011;5:865-7.
10. Jenny J, Cons NC, Kohout FJ, Jakobsen J. Differences in need for orthodontic treatment between native Americans and the general population based on DAI scores. J Public Health Dent 1991;51:234-8.
11. Oshagh M, Salehi P, Pakshir H, Bazyar L, Rakshian V. Associations between normative and self-perceived orthodontic treatment needs in young adult dental patients. Korean J Orthod 2011;41:440-6.
12. Rekhi A, Mehra A, Saini Y. Assessment of the severity of malocclusion and orthodontic treatment needs among 16-24-year-old rural population of Dehradun, India: a cross-sectional study. J Indian Assoc Public Health Dent 2016;14:57-62.
13. Raina R, Vinod K, Raina S, Sameer A, Manish B, Aruna K, et al. Assessment of malocclusion and orthodontic treatment needs among 13- to 15-year-old school-going children of Bengaluru north: a cross-sectional study. Int J Oral Care Res 2017;5:105-12.
14. Otuoyemi OD, Ogunyaika A, Dosumu O, Cons NC, Jenny J. Malocclusion and orthodontic treatment need of secondary school students in Nigeria according to the dental aesthetic index (DAI). Int Dent J 1999;49:203-10.
15. Shivakumar KM, Chandu GN, Subba Reddy VV, Shafullla MD. Prevalence of malocclusion and orthodontic treatment needs among middle and high school children of Davangere city, India by using dental aesthetic index. J Indian Soc Pedod Prev Dent 2009;27:211-8.