Epidemiology of Malocclusion: An Indian Perspective-Review Article
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Abstract

Millions of individuals worldwide are suffering from orodental problems in spite most of them being preventable. Malocclusion is one of them. In a diverse and vast country like India, there exists a large variation in prevalence of malocclusion. This can be due to variations in ethnicity, nutritional status, religious beliefs, and dietary habits. Various studies have been conducted among Indian regional populations so far. This review gives an overview of the prevalence of malocclusion documented in various epidemiological studies.

Keywords: Malocclusion, Prevalence and Epidemiology studies.

INTRODUCTION

The oral-facial region is usually an area of significant concern for the individual because it draws the most attention from other people in interpersonal interactions and is the primary source of vocal, physical and emotional communication [1]. Adolescent with significant dentofacial discordance suffer from negative self-esteem and social maladjustments [2]. Malocclusion is a developmental condition, not a disease, which is included under the heading of Handicapping Dentofacial Anomaly by World Health Organization and is defined as “An anomaly which causes disfigurement or which impedes function, and requires treatment if the disfigurement or functional defect was likely to be an obstacle to the patient’s physical or emotional well-being [3].

Currently malocclusion is third in the ranking of priorities among the problems of dental public health worldwide, surpassed only by dental caries and periodontal diseases [4]. It is the second common dental disorder next to dental caries among children and young adults. About 30-40% children suffer from malaligned teeth affecting proper functioning of dentofacial apparatus and aesthetics [5]. Across the globe the prevalence of malocclusion is considerably high in Europe (nearly 80%) among the Caucasian population and in African countries like Kenya, Nigeria and Tanzania it is ranging from 72 to 86% [6].

India being a large country with its multiracial and multiethnic inhabitants shows a definite variation in the prevalence of malocclusion from north to south region. The prevalence of malocclusion in India has reported wide variation from as low as 19.6% to as high as 96.05% [7]. It is often required to document the prevalence and distribution of oral diseases and understand the dental health practices that people follow as this information is basic for formulation of oral health policies and appropriate programs [8, 9]. This review provides a compilation of regional data to ascertain, highlight and further compare the epidemiological diversity of malocclusion in a huge country like India.

Recording and measuring malocclusion

There is a wide variation in the prevalence of malocclusion by different studies which attributes to different methods employed for recording malocclusion.

The methods of measuring malocclusion are of two types:
- Qualitative methods Devised mainly for epidemiological studies
- Quantitative methods

Qualitative methods [3, 10-12]

Earlier the methods used for recording malocclusion were qualitative ones and were based on descriptive Angle’s classification of malocclusion with...
Quantitative Methods

Few Indices were developed primarily for epidemiological purpose of recording the malocclusion while others were developed in order to grade the severity of malocclusion and to distinguish between malocclusion requiring urgent treatment or a priority of treatment over others. Some prominent epidemiological indices are:

- Occlusal Index [11], Dental Aesthetic Index [13-16], Treatment Priority Index [6], Handicapping malocclusion assessment [17], Peer Assessment Rating Index [14, 15] (PAR), Index of Complexity, Outcome and Need [18].

Malocclusion in India

The prevalence of malocclusion in India has been observed to be ranging from 20% to 43% [19]. There is a definite racial and geographical variation between the northern and southern parts of India. The prevalence of Class II malocclusion in Delhi and Haryana (North India) is much higher (10-15%) as compared to Bangalore and Thriruvananthapuram (South India) where it is around 5%. In addition, the southern population has an ethnic affinity for bimaxillary protrusion. Class I malocclusion is the most prevalent malocclusion in India followed by class II and class III [20].

The prevalence and severity of malocclusion is more in urban Indian population than in rural and tribal population and it is more among females than their male counterparts as observed in a study on rural areas of Nalgonda (Andhra Pradesh) [21]. Similar observations were made while studying malocclusion in Tribal children of Mandu (Central India) where most of them had either no or minimal occlusal irregularities. The prevalence of malocclusion in tribal Indian children was found to be very low compared to the urban Indian children [22].

Prevalence of malocclusion in India as reported by various studies:

- 1940-60: Shourie was the first to report prevalence of malocclusion in Punjab as almost 50% [20, 23].
- 1960-70: Shaikh reported the frequency of various types of malocclusion as class I 68.0%, Class II Div 1 as 28.8%, Class II Div 2 as 2.4%, and Class III as 0.8% [24].

Miglani, Tiwari A reported prevalence rate of malocclusion 19.6-37.52% among Punjabi subjects [6]. Jacob et al., found 49.2% of students in Trivandrum had malocclusion [25]. Nagaraja Rao et al., examined 511 school children of both sexes in the age of 5-15 years in Udupi district of South India. Of these 23% children had class I, 4.5% had Class II, and 1.3% had Class III malocclusion [26]. Singh et al., observed the prevalence of malocclusion in rural children in Haryana was 55.3% [7]. Rao DB et al., in a study in Udupi district, Karnataka reported the prevalence of Class I malocclusion to be 23.0%. Class II -4.5% and Class III- 1.3% [27]. Shiva kumar et al., in a study in Davangere reported 80.1% of school children had little or no malocclusion [28].

<table>
<thead>
<tr>
<th>Author, Year</th>
<th>Subjects</th>
<th>Age (in years)</th>
<th>Method Of Recording</th>
<th>Prevalence of Malocclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andhra Pradesh</td>
<td></td>
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<tr>
<td>Suma, Chandra Shekar, Manjunath</td>
<td>1794: Male-961 Female-833</td>
<td>15</td>
<td>Dental Aesthetic Index(DAI)</td>
<td>Definite Malocclusion-9.9% Severe Malocclusion-3.5% Very severe Malocclusion-3.8%</td>
</tr>
<tr>
<td>Manjunath (2011) [29]</td>
<td></td>
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<tr>
<td>Muppa et al (2013) [30]</td>
<td>844: Male-555 Female-289</td>
<td>6-30</td>
<td>Angle’s Classification</td>
<td>Class I-14.34% Class II -9.95% Class III-5.33%</td>
</tr>
<tr>
<td>ChhattisgarH</td>
<td></td>
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<tr>
<td>Kumar et al., (2012) [31]</td>
<td>883: Male-675 Female-208</td>
<td>7-18</td>
<td>Dental Aesthetic Index (DAI)</td>
<td>Definite malocclusion-2.9% Severe Malocclusion-2.5% Very severe Malocclusion-1.4%</td>
</tr>
<tr>
<td>Chandigarh</td>
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<tr>
<td>Singh, Utreja, Chawla (1993) [32]</td>
<td>410: Male-161 Female-249</td>
<td>12-30</td>
<td>Angle’s Classification</td>
<td>Class I-50.5% Class II division 1-40% Class II division 2-5.85% Class III-3.2%</td>
</tr>
</tbody>
</table>

Table 1: State-Wise Distribution of Malocclusion
<table>
<thead>
<tr>
<th>Region</th>
<th>Study Details</th>
<th>Sample Size</th>
<th>Age Group</th>
<th>Malocclusion Criteria</th>
<th>Prevalence</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Haryana</strong></td>
<td>Damle D et al., (2014) [33]</td>
<td>1322</td>
<td>12-15</td>
<td>Dental Aesthetic Index (DAI)</td>
<td>Prevalence- 23.6%</td>
<td>Definite malocclusion- 12 year- 16.6%, 15 year- 13.7% Severe Malocclusion- 12 year- 5.6%, 15 year- 4.3% Very severe Malocclusion- 12 year- 3.6%, 15 year- 3.5%</td>
</tr>
<tr>
<td>Delhi</td>
<td>Kharbanda et al., (1995) [34]</td>
<td>5554</td>
<td>5-13</td>
<td>Dental Aesthetic Index (DAI)</td>
<td>Prevalence of malocclusion- 45.7%</td>
<td>Mild- 18.34% Moderate to Severe- 27.26% Handicapping Malocclusion- 0.1%</td>
</tr>
<tr>
<td>Gujarat</td>
<td>Sanadhya et al., (2014) [35]</td>
<td>957</td>
<td>12-15</td>
<td>Dental Aesthetic Index (DAI)</td>
<td>Overall malocclusion- 33.4%</td>
<td>Definite malocclusion- 24.9% Severe Malocclusion- 6.4% Very severe Malocclusion- 2%</td>
</tr>
<tr>
<td>Jammu &amp; Kashmir</td>
<td>Singh et al., (1998) [7]</td>
<td>1019</td>
<td>12-16</td>
<td>Angle’s Classification</td>
<td>Prevalence of malocclusion- 55.3%</td>
<td>Class I- 43.6% Class II- 9.8% Class III- 0.6%</td>
</tr>
<tr>
<td>Himachal Pradesh</td>
<td>Bhardwaj, Veeresha, Sharma (2011) [36]</td>
<td>622</td>
<td>16-17</td>
<td>Dental Aesthetic Index (DAI)</td>
<td>Definite Malocclusion- 16.39%</td>
<td>Severe malocclusion- 3.69% Very severe Malocclusion/ handicapping Malocclusion- 0.34%</td>
</tr>
<tr>
<td>Karnataka</td>
<td>singh et al., (2011) [41]</td>
<td>927</td>
<td>12</td>
<td>Dental Aesthetic Index (DAI)</td>
<td>Prevalence of malocclusion- 13%</td>
<td>Definite Malocclusion- 3.7% Severe Malocclusion- 0.5% -handicapping Malocclusion</td>
</tr>
<tr>
<td></td>
<td>Nagarajan, Pushpanjali (2010) [40]</td>
<td>1618</td>
<td>14-15</td>
<td>Dental Aesthetic Index (DAI)</td>
<td>Prevalence of malocclusion- 15.7%</td>
<td>-Definite Malocclusion 3.7% -Severe malocclusion 0.5% -handicapping Malocclusion</td>
</tr>
<tr>
<td></td>
<td>Nagarajan, Pushpanjali (2010) [40]</td>
<td>1618</td>
<td>14-15</td>
<td>Dental Aesthetic Index (DAI)</td>
<td>Prevalence of malocclusion- 21%</td>
<td>Definite malocclusion- 14.1% Severe Malocclusion- 4.6% Very severe Malocclusion/ handicapping Malocclusion- 2.3%</td>
</tr>
<tr>
<td></td>
<td>Nagarajan, Pushpanjali (2010) [40]</td>
<td>1618</td>
<td>14-15</td>
<td>Dental Aesthetic Index (DAI)</td>
<td>Prevalence of malocclusion- 21%</td>
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<tr>
<td>Madhya Pradesh</td>
<td>Jalili et al., (1993) [43]</td>
<td>1085 Boys-775 Girls-310</td>
<td>6-14</td>
<td>Dental Aesthetic Index (DAI)</td>
<td>Prevalence of malocclusion-14.4%</td>
<td>Definite malocclusion-10.5%</td>
</tr>
<tr>
<td>Maharashtra</td>
<td>Garcha, Shetiya, Kakodkar (2011) [44]</td>
<td>3500 Male-2330 Female-1170</td>
<td>10-18</td>
<td>Dental Aesthetic Index (DAI)</td>
<td>Definite malocclusion-25.71%</td>
<td>Severe Malocclusion-10.51%</td>
</tr>
<tr>
<td></td>
<td>Ahammed et al., (2013) [45]</td>
<td>165 Male-103 Female-62</td>
<td>12-15</td>
<td>Dental Aesthetic Index (DAI)</td>
<td>Definite malocclusion-10.3%</td>
<td>Severe Malocclusion-5.5%</td>
</tr>
<tr>
<td></td>
<td>Panhalkar P et al., (2018) [47]</td>
<td>483</td>
<td>10-16</td>
<td>WHO Criteria</td>
<td>Class I- 66.3%</td>
<td>Class II-32.7%</td>
</tr>
<tr>
<td>Rajasthan</td>
<td>Dhar et al., (2007) [48]</td>
<td>1587 Boys-827 Girls-760</td>
<td>5-14</td>
<td>Dental Aesthetic Index (DAI)</td>
<td>Total prevalence-36.42%</td>
<td>No malocclusion-63.58%</td>
</tr>
<tr>
<td></td>
<td>Trehan, Chugh, Sharma (2009) [49]</td>
<td>700</td>
<td>16-26</td>
<td>Angle’s classification</td>
<td>Normal Occlusion-33.3%</td>
<td>Class I malocclusion-57.9%</td>
</tr>
<tr>
<td>Tamil Nadu</td>
<td>Joseph, Dhinahar, Reddy (2011) [50]</td>
<td>613 Boys-334 Girls-279</td>
<td>12</td>
<td>Dental Aesthetic Index (DAI)</td>
<td>Definite malocclusion-25.1%</td>
<td>Severe Malocclusion-12.1%</td>
</tr>
<tr>
<td></td>
<td>Reddy et al., (2011) [51]</td>
<td>300 Boys-161 Girls-139</td>
<td>12-15</td>
<td>Dental Aesthetic Index (DAI)</td>
<td>Overall prevalence-73.7%</td>
<td>Definite malocclusion-36.7%</td>
</tr>
</tbody>
</table>

**Conclusion**

Developing countries like India are struggling to eradicate many medical and dental diseases. The main reason behind this is inadequate implementation of preventive oral health care programmes which requires a sound base of epidemiological data. Epidemiological studies on occlusion and malocclusion not only help in orthodontic treatment planning and evaluation of dental health services but also offer a
valid research tool for ascertaining the operation of distinct environmental and genetic factors in the aetiology of malocclusion [9]. Therefore, extensive multi centric studies are required to obtain a countrywide representative data.

REFERENCES


