

# An overview of malocclusion in India

## Abstract

With a population of more than one billion, India is the most populous democracy in the world, second in population next to China and seventh largest country in the world by area. Being a vast and diverse country with such a huge population, there exist differences in demography, nutrition, culture, feeding habits, ethnicity and religious beliefs. People are residing at various geographic areas; from the hilly terrains of Himachal Pradesh to the deserts of Rajasthan and from metropolitan cities like Delhi and Mumbai to the tribal corners of this country. Though various studies have been conducted among diverse Indian regional populations, there are no reviews comparing the state-wise prevalence of malocclusion in India. In this review, a few epidemiological studies on state-wise prevalence of malocclusion traits in India are highlighted and further compared, so as to ascertain the epidemiological diversity of orthodontics in a huge country like India.

**Keywords:** malocclusion, prevalence of malocclusion, malocclusion in India

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## Introduction

Millions of individuals worldwide are suffering from oro-dental problems in spite of most of them being preventable. Malocclusion is one of them. Malocclusion is not a disease but a morphological variation which may or may not be associated with pathological conditions. Malocclusion is one of the most prevalent oral pathologies, next only to dental caries and periodontal disease and usually ranked third among worldwide public health dental disease priorities.<sup>1</sup>

Developing countries like India are struggling to eradicate many medical and dental diseases. The main reason behind this is an inadequate implementation of preventive oral health care programmes which need 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.<sup>2</sup>

Facial appearance has a long lasting implication on an individual. An unacceptable dental appearance has often been associated with a negative effect on self-image, career advancement and peer-group acceptance. In order to prevent a wide-spread impact on their psychological development, children having very severe or handicapping malocclusion should be identified and corrective measures should be instituted at the earliest.<sup>3</sup>

Early prevention and interception of a disease can reduce the burden of cost and more expensive treatment modalities on the nation. Extensive multicentric studies are required to obtain a countrywide representative data. A more practical and feasible alternative is to develop a regional database; compilation of such databases may provide an understanding of the national scenario.

## State-wise epidemiology of malocclusion in India

Various studies have been conducted on epidemiology of malocclusion throughout the length and breadth of India. But studies showing state-wise variation are rare. In this review, a few studies

from various states of India are mentioned and compared to find the regional variations.

### Himachal pradesh

Chauhan D et al.,<sup>4</sup> in their study observed severe malocclusion in 3.1% children. 8% showed some form of malocclusion requiring an elective orthodontic treatment. Mandatory orthodontic treatment was required in about 1.3% children who had a handicapping malocclusion. Equal number of males and females were affected. These variations were attributed to racial and genetic variations as well as varying sample sizes and age groups.<sup>4</sup>

Pruthi N et al.,<sup>5</sup> also observed malocclusion in 53% of the sample and Dental Aesthetic Index scores indicated malocclusion ranging from definite to handicapping. A higher frequency of crowding, open bite and spacing was observed in children who had some form of deleterious oral habits like mouth breathing and tongue thrusting.<sup>5</sup>

### Rajasthan

There is a definite variation in the pattern of malocclusion between the hills of Himachal Pradesh and the deserts of Rajasthan. The prevalence of malocclusion was 66.7% in a study done in Jaipur out of which 57.9% had Angle's class I malocclusion. Lower incidence of Angle's class II division 2 (1.9%) and Angle's class III malocclusion (1.4%) was observed.<sup>6</sup> In a similar study, prevalence of malocclusion was 36.42% out of which 29.74% had mild to moderate malocclusion and 6.68% had a more severe malocclusion. No significant gender difference was observed.<sup>7</sup>

### Karnataka

In a study conducted in Udupi, prevalence of Class I malocclusion was 23.0%, Class II was 4.5% and Class III was 1.3%.<sup>8</sup> In another study conducted in Devangere, 80.1% of school children had little or no malocclusion requiring no or minimum orthodontic treatment, 15.7% with definite malocclusion requiring elective treatment, 3.7% with severe malocclusion highly indicated for treatment and

only 0.5% with handicapping malocclusion requiring compulsory orthodontic treatment.<sup>9</sup>

### Andhra pradesh

R Muppa et al.,<sup>10</sup> in his study observed anterior crowding in 27.37% subjects, deep bite in 20.5%, Class I in 14.34%, Class II in 9.95%, Class III in 5.33%, anterior spacing in 12.9%, anterior cross bite in 4.98% and open bite in 4.62% subjects. He observed that malocclusion is often associated with periodontal disease and temporomandibular disorders and plays an important role in the overall oral health of an individual.<sup>10</sup>

Suma S et al.,<sup>11</sup> compared the prevalence and severity of malocclusion between the rural and urban children of Nalgonda district and observed that the prevalence of malocclusion was more among females (21.8%) than males (13.2%) and more in urban (20.8%) than in rural areas (14.9%). He attributed this to socio-economic variations and different dietary habits.<sup>11</sup>

### Kerala

Jacob PP in his study reported the prevalence of malocclusion as 49.2% in Thiruvananthapuram. Class I malocclusion was seen in 44%, Class II in 4.9% and class III was seen in 0.3% of the study sample.<sup>12</sup>

### Tamil nadu

Radha Krisna G et al.,<sup>13</sup> observed the prevalence of malocclusion in primary dentition in Chennai as 62.5% out of which 81% had Class I malocclusion, 15.3 % had Class II, only 3 % had Class III and 47.2% had crowding.<sup>13</sup> Joseph John in a similar study reported that 56.3% had no malocclusion, 25.1% had a definite malocclusion, 12.1% had a severe malocclusion and 6.2% had a handicapping malocclusion and concluded that the need to implement preventive and interceptive orthodontic care is of utmost importance to improve the aesthetic perception and social function.<sup>14</sup>

### Delhi

Kharbanda et al.,<sup>15</sup> studied 4500 children in Delhi aged 5-13 years from various urban, peri-urban and rural locations. The study sample was divided into 2 groups i.e. the mixed dentition group and the late mixed/permanent dentition group. In the first group, class I molar relation was seen in 91.6% children and 6% exhibited class II molar relation. Similarly deciduous molar relation revealed mesial step in 90.3% and distal step in 8.6%. Lower anterior crowding was seen in 11.7% sample. In the second group, malocclusion was seen in 45.7% children; out of which Class I was seen in 27.7%, class II in 14.6% and class III was seen in 3.4% children. Prevalence of anterior crowding in maxilla was 9.5% and in mandible, it was 18%. No significant gender difference was observed. But crowding in maxillary anterior teeth was observed more frequently in girls than boys.<sup>15</sup>

### Madhya pradesh

In a study on tribal children, a lower prevalence of malocclusion than the urban children. 85.6% of them were free from any anomalies of occlusion. Malocclusion was prevalent in only 14.4% of study population. Out of this, majority (10.5%) had mild malocclusion and a few (3.7%) had moderate to severe malocclusion. The handicapping malocclusion was observed in 0.2% only. The prevalence of class II relationship was 3.8%, of which full cusp dist occlusion was seen in

0.6% only. Increased overjet and overbite were found in 0.4% and 0.3%. Prevalence crowding of anterior teeth in the maxillary arch was 6.4% and in the mandibular arch was 7.8%.<sup>16</sup>

### Haryana

A study conducted in Raipur Rani and Naraingarh blocks in Ambala revealed Class I malocclusion in 14.4% children, Class II in 13.5% children and Class III in 1.3% children. 10.3% children had malocclusion associated with some form of abnormal oral habits.<sup>17</sup>

Singh et al observed that the prevalence of malocclusion in rural children in Haryana was 55.3%. The prevalence of class I malocclusion was 43.6%, Class II 9.8%, class III 0.6%, bimaxillary protrusion 0.5% and mutilated occlusion was in 0.8%.<sup>18</sup>

### Punjab

Robert S Corrucini et al.,<sup>19</sup> in his study on rural youths observed an increased prevalence of crossbite in urban population while difference in overjet between urban and rural youths was not statistically significant.<sup>19</sup> Singh SP et al.,<sup>20</sup> observed a significant association between thumb sucking exceeding 18 months and the presence of Class II skeletal malocclusion, open bite and extreme overjet. They concluded that if thumb sucking is not treated early, it may result in skeletal Class II malocclusion, increased overjet and an anterior open bite.<sup>20</sup>

### Chhattisgarh

In a study done in Bilaspur, 33.2% of participants had no abnormality or minor malocclusion, which needed no or minor treatment. Only 2.9%, 2.5% and 1.4% of subjects had definite, severe and very severe or handicapping malocclusion respectively for which treatment desirable was elective, highly desirable and mandatory respectively.<sup>21</sup> In another study oral habits were found to be an important etiological factor associated with the development of malocclusion and it was concluded that an early diagnosis and prompt interception of these habits will definitely reduce the prevalence of malocclusion.<sup>22</sup>

### Uttar pradesh

Singh observed a malocclusion prevalence of 34.09% in his study. It was more in older children than their younger counterparts. No significant gender difference was observed.<sup>23</sup> In another study, the prevalence of Class III malocclusion in North Indian population was 3.4%. In Caucasians, it varies from 0.8 to 4.0% and significantly higher in Chinese and Japanese populations (12-13%).<sup>24,25</sup>

### Maharashtra

JT Nainani et al.,<sup>26</sup> his study observed spacing in 40.36%, deep bite in 38.08%, crowding in 31.88%, rotation in 15.36%, cross bite in 5.5% and open bite in 2.98% of school children. Class I molar relationship was observed in 77.29%, Class II in 5.04% and Class III in 2.50%. It was concluded that mere estimation of prevalence of malocclusion may not reveal true disease severity or treatment need, both of which are of paramount importance in public health planning.<sup>26</sup>

### Gujarat

Joshi et al.,<sup>27</sup> studied the pattern of spacing in the normal deciduous dental arches. They found spaced type of dentition more common

than closed type. Spacing was seen more frequently in males than in females. Spacing on the left side was more common than right side. Spacing between the mandibular incisors was the greatest of all.<sup>27</sup>

## Discussion

Prevalence of malocclusion traits shows a definite ethnic and geographical variation. Worldwide data shows it to be more prevalent in whites than in blacks, more in developed countries than developing countries and more in urban as compared to rural population. 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 Thiruvananthapuram (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.<sup>28</sup>

One of the first recorded studies on prevalence of malocclusion was done by Angle who examined 1000 school children of St. Louis, Missouri and observed that 69% had Class I malocclusion, 19% Class II, 3.4% Class III and asymmetric occlusion was found in 4.6% of Caucasians under study.<sup>29</sup> Many studies have been done since then worldwide by Chiavaro A,<sup>12</sup> Korkhaus G,<sup>30</sup> Altamus LA,<sup>31</sup> Horowitz et al.,<sup>32</sup> and many others. These studies showed a higher prevalence of malocclusion than in Indian population when compared with studies done during the same period in India by Shourie KL, Miglani, Tiwari A and others who observed 19.6-37.52% as the prevalence in Punjabi subjects.<sup>33</sup>

The prevalence of malocclusion in India has been observed to be ranging from 20% to 43%<sup>27</sup> Class I malocclusion ranges from 66.7% in the desert state of Rajasthan 7(North India) to 49.2% in Bangalore (south India)<sup>34</sup> to 91.6% in 5-9 year age group and 27.7% in 10-13 years age group in New Delhi (Central India).<sup>34</sup> These results shows lesser prevalence of Class I malocclusion as compared 62.9% in Latino Adolescents as was observed by Silva RG et al.,<sup>35</sup> and 80.7% in Benin City, Nigeria as observed by Emmanuel OA in his study sample.<sup>36</sup>

The prevalence of Class II malocclusion in India varies from 1.9% in Rajasthan 6 to 4.6% in Bangalore<sup>34</sup> to 6% in 5-9 year age group and 14.6% in 10-13 years age group in New Delhi.<sup>33</sup> These results were significantly different from those by Emmanuel OA,<sup>36</sup> who observed 1.1% as the prevalence of Class II in Benin city, Nigeria and Silva RG et al.,<sup>35</sup> who observed 21.5% as the prevalence of class II malocclusion in Latino Adolescents.

Similarly, Class III malocclusion ranges from 1.4% in Rajasthan 6 to 0.3% in Bangalore 34 to 3.4% in 10-13 years age group in New Delhi.<sup>33</sup> These findings are different from Caucasians, where it ranges from 0.8 to 4.0% and Chinese population where it is very high as compared to Indian population (12-13%).<sup>25</sup>

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 by Suma S in her study on rural areas of Nalgonda (Andhra Pradesh).<sup>11</sup> 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 as compared to the urban Indian children.<sup>17</sup>

## Conclusion

Efforts should be made on a larger scale to obtain a base line data based upon which various public health strategies could be formulated. A risk-benefit analysis should be done and treatment should be instituted only when the perceived benefits in commencing treatment at that time outweigh the potential risks. A significant problem in epidemiological studies is the lack of uniformity in the measurement criteria between various studies since there is no universally accepted index for measuring malocclusion and most of them show significant intra and inter examiner variability. Further research would therefore be needed to develop better indices or to improve the available indices so that they can be universally standardized and epidemiologically accepted. Prevention of occurrence of dental caries by various preventive programmes and an early treatment of caries still remain one of the best means of reducing the occurrence of malocclusion traits, especially crowding. A systematic and well-organized dental health care program in a community requires some basic information, such as epidemiological studies on the prevalence of orthodontic parameters. In developed countries with a well-developed orthodontic care system, such information is readily available. But in developing countries like India, this information is usually lacking and extensive studies need to be carried out in future.

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## Conflicts of interest

The author declares there is no conflicts of interest.

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