Prevalence of malocclusion among adolescents in South Indian population

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Abstract

Objective: To record prevalence of malocclusion among 2,400 adolescents in Karnataka state, India and to define difference in malocclusion status in urban and rural population. Design: Randomized cross-sectional study. Setting: School students of Karnataka state, 24 August 2011 to 30 March 2012. Participants: School students in the age group of 13-17 years. Materials and Methods: Each individual was assessed for occlusal traits - sagittal occlusion, overjet, overbite, crowding, midline diastema, and crossbite. Statistical Analysis Used: Examinations were computerized and analyzed using Statistical Package for Social Sciences version 16. Chi-square test was used for computing statistical significance. Results: 87.79% of population had malocclusion. Out of which 89.45% had class I, 8.37% had class II, and 2.14% had class III malocclusion. Normal overjet and overbite was seen in 48.22 and 49.87% of subjects, respectively. Frequency of crowding was 58.12% and 15.43% of subjects had midline diastema. Anterior crossbite was present in 8.48% and posterior crossbite in 0.99%. Urban population had twice the class II sagittal occlusion, and increased overjet as compared to rural population. Conclusions: Malocclusion is widely spread among population of Karnataka state, with greater prevalence in urban population. Early exfoliation of deciduous teeth and refined diet can be considered as viable etiological factors.

Key words: Buccal occlusion, crossbite, crowding, malocclusion, midline diastema, overjet, overbite, prevalence, sagittal occlusion

INTRODUCTION

Significance of any disease in particular area can be gauged by its prevalence. This becomes even more important for developing country like India where oral health program and preventive measures are far from satisfying needs.

Prevalence of malocclusion has been studied in adolescents of Cicero,[¹] Negro children of Columbia,[²] Black American children in the Evanston-Oak Park of Illinois,[³] Minnesota,[⁴] Indiana and Kikuyu tribe of Kenya,[⁵] Korean cleft patients,[⁶] Hvar Island Croatia,[⁷] Italian students,[⁸] Hungarian population,[⁹] Naples,[¹⁰] Iranian school children,[¹¹] and Tanzanian school children.[¹²]

Karnataka state, is an active agriculture place with people from a wide spectrum of cultural and religion background. To date there is no available data on status of prevalence of malocclusion in Karnataka. Thus aim of the study was to record prevalence of malocclusion and to define difference in malocclusion status in urban and rural population.

MATERIALS AND METHODS

The sample size was determined from a pilot study conducted at Hassan district. Thus, the study was conducted among 2,400 school students in the age group of 13-17 years. The study group was taken both from urban and rural areas in the proportion of 1:2, respectively.
from 30 districts of Karnataka using simple random sampling procedure. [Table 1 and Figure 1]

Inclusion criteria

- No previous orthodontic treatment done
- Secondary dentition present with no remaining deciduous teeth
- All had their first permanent molars.

The criterion was limited to occlusal anterio-posterior (A-P) relationship, crowding, overjet, overbite, midline diastema, and crossbite.

Informed consent was taken and was confirmed by one of the parent.

Examination procedure

Each subject was examined by a single examiner with aid of natural light. Torch was used whenever required. Occlusal characteristics were assessed with the help of mouth mirror and metallic scale [Table 2].

The study was conducted over a period of 7 months starting from 24 August 2011 - 30 March 2012.

RESULTS

12.21% had class I normal occlusion. 15.43% of rural and 9% of urban population had class I normal occlusion with statistically significant difference between rural and urban population ($P = 0.000$) [Figure 2]. Class I sagittal occlusion was found in 89.45% of the subjects, Class II in 8.37%, and Class III in 2.14% with statistically significant difference ($P = 0.00$) between two groups [Table 3 and Figure 3].

Normal overjet was seen in 48.22%, excessive in 33.71%, and reduced in 18.07% [Figure 4]. The difference between urban and rural population was statistically significant ($P = 0.000$) with urban population having more of increased overjet. Normal overbite was seen in 49.87%, deep in 35.97%, and reduced in 14.15% of total sample with no statistically significant difference between urban and rural population ($P = 0.083$) [Table 3 and Figure 5].

The frequency of crowding was 58.12%. Urban population had 58.25% and rural had slightly less (57.37%), but difference was not statistically significant ($P = 0.683$) [Figure 6]. Midline diastema was present in 15.43% with no statistically significant difference ($P = 0.551$) between urban and rural population [Table 3 and Figure 7].

Anterior crossbite was present in 8.48% of subjects. Urban population had 8.25% and rural had 8.56% anterior crossbite with no statistically significant

Table 1: Distribution of sample

| Location | Males | Females | Total |
|----------|-------|---------|-------|
| Urban    | 365   | 435     | 800   |
| Rural    | 827   | 773     | 1600  |

Table 2: Method of registration

| Variable      | Method of registration                                      |
|---------------|-------------------------------------------------------------|
| Sagittal occlusion | Angle classification                                |
| Overjet       | Overjet of more than 3 mm was taken as increased |
| Overbite      | It was considered more if it was more than 2 mm and decreased if less than 2 mm |
| Crowding      | Was considered as present when there was overlapping of one tooth with respect to other tooth |
| Midline diastema | Was considered as present if there was space of more than 1 mm between the central incisors in either arch |
| Crossbite     | If one or more maxillary teeth are placed palatal/lingual to the mandibular teeth |

Figure 1: Normal population distribution

Figure 2: Prevalence of normal occlusion
Table 3: Prevalence of occlusal traits

|                        | Urban | %    | Rural | %    | Chi-square | P value | Significance |
|------------------------|-------|------|-------|------|------------|---------|--------------|
| Occlusion              |       |      |       |      |            |         |              |
| Class I                | 72    | 9.00 | 247   | 15.43| 19.178     | 0.000   | HS           |
| AP relation            |       |      |       |      |            |         |              |
| Class I                | 670   | 83.75| 1480  | 92.50| 44.51      | 0.00    | HS           |
| Class II               | 104   | 13.16| 95    | 5.97 |            |         |              |
| Class III              | 26    | 3.29 | 25    | 1.57 |            |         |              |
| Overjet                |       |      |       |      |            |         |              |
| Normal                 | 343   | 42.87| 814   | 50.87| 15.80      | 0.000   | HS           |
| Excessive              | 309   | 38.63| 500   | 31.25|            |         |              |
| Reduced                | 148   | 18.50| 286   | 17.87|            |         |              |
| Overbite               |       |      |       |      |            |         |              |
| Normal                 | 368   | 46.00| 829   | 51.81| 4.977      | 0.083   | NS           |
| Excessive              | 304   | 38.00| 539   | 34.93|            |         |              |
| Reduced                | 128   | 16.00| 212   | 13.25|            |         |              |
| Crowding               |       |      |       |      |            |         |              |
| Present                | 466   | 58.25| 918   | 57.37| 0.167      | 0.683   | NS           |
| Absent                 | 334   | 41.75| 682   | 42.63|            |         |              |
| Diastema               |       |      |       |      |            |         |              |
| Present                | 120   | 15.00| 255   | 15.94| 0.356      | 0.551   | NS           |
| Absent                 | 680   | 85.00| 1345  | 84.06|            |         |              |
| Anterior crossbite     |       |      |       |      |            |         |              |
| Present                | 66    | 8.25 | 137   | 8.56 | 0.067      | 0.816   | NS           |
| Absent                 | 734   | 91.7 | 1463  | 91.43|            |         |              |
| Posterior crossbite    |       |      |       |      |            |         |              |
| Present                | 66    | 8.25 | 137   | 8.56 | 2.52       | 0.112   | NS           |
| Absent                 | 734   | 91.7 | 1463  | 91.43|            |         |              |

AP = Antero-posterior, HS = Highly significant, NS = Not significant

**DISCUSSION**

This survey provides the first estimate of prevalence of malocclusion in Karnataka state. Examination was confined to high school students because of ease of accessibility\(^1\) with a complete permanent dentition as malocclusion occurring in the mixed dentition is sometimes transitional leading to erroneous conclusions.

Qualitative and quantitative methods available for measuring malocclusion are not truly inclusive of all occlusal criteria\(^1\)\(^\text{14}\) thus, an alternative approach was used to register malocclusion by using occlusal characteristics. Angle’s classification that is reliable, repeatable\(^1\)\(^5\) and ideally oriented for a broad population study\(^1\)\(^6\) was used for checking sagittal...
occlusion. Malocclusion has often been referred to as a “disease of civilization”, signifying that it is found (or at least reported) primarily in urbanized populations. This calls for rural-urban dichotomy.

Prevalence of malocclusion was high and comparative to studies conducted by Rajendra in Bangalore city, Kharbandha in Delhi, by Altemus in Negro children, and U.S Public Health Survey. Findings of this present study were in disagreement with Guaba (1998) in the district of Ambala (70.8 per cent had normal occlusion).

Prevalence of malocclusion was comparatively less (7%) as compared to studies conducted on Chinese.

Class I molar relation was almost the same as found in studies conducted in Minnesota. There was a significantly higher prevalence of Class III occlusion among the Chinese, Malays, and blacks as compared to the Indians. Prevalence of overjet and overbite found in present study was same as that in urban Iranian school children, Yoruba adolescents in Ibadan, Nigeria, and study conducted on three ethnic races; Chinese, Malay, and Indian in Malaysia.

Crowding was present in 57.69% of subjects. This was similar to the finding of Usha Mohan Das and Ali Borzabadi that crowding anterior was most common finding in subjects with class I malocclusion. This was in accordance with study conducted by Woon that stated crowded dentition was also a norm for the three races: Chinese, Malay, and Indian. Prevalence of crowding was same as seen in the Hvar island, Croatia; among Lithuanian school children; in Naples; in Rio de Janeiro State, Brazil; and Jordanian subjects. Much less prevalence of crowding was seen among adolescents of Ibadan, Nigeria (20%).
Present study found midline diastema in 15.65% of subjects. This prevalence was much more as compared to study[20] conducted by Gnanasundaram and Hashim on prevalence of midline diastema (1.6%) in Chennai city. Prevalence of midline diastema was much less than adolescents of Ibadan, Nigeria (37%).[13] Anterior cross bite was present in 8.46% and posterior cross-bite was present in 0.88%. Posterior crossbite was recorded much more (8.8%) among Lithuanian schoolchildren; Rio de Janeiro State, Brazil (19.2%); urban Iranian school children; and in Lahore city (24%), Pakistan[11,23,24,27] Difference was much more as compared to Lahore city as in their study data was collected from patients who visited department of orthodontics.

Urban population had twice the class II sagittal occlusion and increased overjet as compared to rural population. This difference was similar to the study[20] done to assess occlusal variation in three southwest Pacific populations. Dietary consistency can be considered as viable reason as the posterior region of mandible is associated with muscles of mastication.[29] As far as anterior region is concerned habits can be considered as reason for discrepancy in urban and rural population. Further research is needed to determine whether there is association between above written factors and malocclusion.

This study is limited as it has only recorded malocclusion in age group of 13–17 years which cannot be generalized to entire population. Secondly, orthodontically treated cases were excluded which can underestimate the prevalence of occlusal traits. But the proportion of adolescents who underwent orthodontic therapy and excluded were relatively small and thus does not make statistically significant difference in results. Thirdly, there are considerable variations in figures obtained as different researchers have used different criteria for assessing the same occlusal trait. This lay emphasis on the need to standardize criteria for assessing malocclusion.

CONCLUSION

Malocclusion is widespread in population examined at Karnataka State, India. Prevalence of malocclusion was more in urban population when compared with rural population. Crowded incisors were the most common feature associated with class I malocclusion. Require further studies in area to find etiology for various occlusal traits.

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Kaur, et al.: Malocclusion among adolescents

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