ORIGINAL RESEARCH

To Determine the Prevalence Rate of Malocclusion among 12 to 14-Year-Old Schoolchildren of Urban Indian Population (Bagalkot)

Sandesh Phaphe, Ravi Kallur, Anna Vaz, Jagadeesha Gajapurada, Sugaraddy, Sudha Mattigatti

ABSTRACT

Aim: To determine the prevalence rates of different occlusal characteristics of permanent dentition in 12 to 14 years old children in Bagalkot city and to determine the differences in occlusal characteristics in the same children by age and sex.

Materials and methods: A total of 1000 school going children between the age group of 12 to 14 years were selected in the study from Bagalkot city of India. All the occlusal parameters, such as molar relation, canine relation, overjet, overbite and crowding and spacing were recorded in a record sheet. The gender and sex difference was evaluated using Chi-square test.

Results: According to the classification of Angle, the prevalence of class I, II and III malocclusions was 17.8, 30.1 and 1.6%, respectively. Ideal occlusion was 3.2% where as normal occlusion was 46.8%. An overjet of at least 4 mm or more was present in 15.2 and 7.2% had a reverse overjet. A total of 9.2 had an increased overbite and 10.6% had open bite.

Conclusion: Highly significant (p < 0.001) age differences were found for overjet, overbite and highly significant (p < 0.001) gender differences were found for crowding and spacing.

Clinical significance: The study gives the prevalence of malocclusion amongst 12 to 14 years old in urban Indian population. The data can be used for may research projects and gives us a better understanding of malocclusion in urban Indian population.

Keywords: Malocclusion, Ethnic group, Occlusion epidemiology, Occlusal variation.

INTRODUCTION

One of the difficult situations faced by orthodontist is, identifying the proper occlusion form in mixed dentition phase. During transition from primary dentition to permanent dentition various occlusal characteristics play an important role in the establishment of the normal occlusal relationship. Effect of occlusal characteristics of primary dentition on the subsequent permanent dentition has been the subject of study and discussion for many years. Many studies undertaken across the world which shows difference in ethnic groups, gender difference and age difference.[1-13] The present study was undertaken with aim to determine the prevalence rates of different occlusal characteristics of permanent dentition in 12 to 14 years old children in Bagalkot city in India and to determine the differences in occlusal characteristics in the same children by age and sex.

MATERIALS AND METHODS

The present study design included total of 1000 children, between age of 12 and 14 years, who were residents of Bagalkot city and attended different schools. Children were examined at school and examination was performed by single examiner. For examination, children were seated in an ordinary chair and examined under natural daylight.[14] A portable torch light was used whenever, required for proper illumination. A mouth mirror with good reflecting surface, a straight probe, and graded stainless steel wire were used for intraoral examination.[15] The exclusion criteria for the present study were subjects with presence of gross facial asymmetry, developmental deformities and subjects who have undergone orthodontic treatment.

Following parameters were recorded for each child in a specially designed proforma chart:

Sagittal (anteroposterior) molar and canine relationship was registered from the first molars and graded into class I, II and III based on the Angle's classification.

Overjet (mm): (1) Reverse overjet (when all maxillary incisors were occluding lingually to the mandibular incisors), (2) overjet of 0 to 4 mm, (3) overjet of 5 to 8 mm, (4) overjet of more than 8 mm.

Overbite: (1) No overlap of incisors, (2) overlap of incisors for half or less of the crown height of the mandibular incisor, (3) overlap for more than half, but less than whole, crown height of the mandibular incisor, (4) total overlap of the incisors, or mandibular incisors in contact with palatal mucosa.

Crowding was estimated separately for the anterior and posterior segments of the maxillary and mandibular arches: (0) No crowding, (1) crowding of 1 to 5 mm, (2) crowding of 5 to 7 mm, (3) crowding of more than 7 mm, (–1) spacing of 1 to 5 mm, (–2) spacing of 5 to 7 mm, (–3) spacing of more than 7 mm.

Statistical Analysis

Age and gender difference were evaluated by the Chi-square test. Any value less than $p < 0.05$ were interpreted as statistically significant. To assess examiner reliability, 10% repeat examinations were undertaken throughout the period of data collection and the difference was statistically insignificant difference ($p > 0.05$).

RESULTS

The sample included 520 (52%) males and 480 (48%) females (Table 1). Out of 1000 children, 318 were 12 years of age (169 males and 149 females), 321 were 13 years of age (164 males and 157 females) and 361 were 14 years of age (187 males and 174 females). Prevalence of ideal occlusion was 3.2%, normal occlusion was 46.8%, class I malocclusion was 17.8%, class II malocclusion 30.1% and class III malocclusion was 1.6%. Majority of the children had class I molar relationship followed by class II and III molar relationship. Most of the children had class I canine relationship followed by class II and III canine relationship. Majority of the children studied exhibited overjet and overbite between 0 and 4 mm. Two-thirds of the children showed crowding whereas; spacing was seen in one-thirds of the children. Age-wise significance was seen with (a) Increase in class I canine relationship, (b) decrease in overjet of 5 to 8 mm, (c) decrease in deep bite (mandibular incisors in contact with palatal mucosa) and (d) increase of crowding of 1 to 5 mm and decrease in spacing of 5 to 7 mm (Tables 1, 3, 5, 7 and 9). Females exhibited significantly higher prevalence rates of class III molar relationship, canine relationships, overjet, open bite and crowding. Males exhibited significantly higher prevalence rates of class I molar relationship, overbite and spacing (Tables 2, 4, 6, 8 and 10).

DISCUSSION

The primary objective of our study was to evaluate the prevalence rates of different occlusal characteristics of permanent dentition which included permanent molar and canine relationship, crowding and spacing, etc. for different age groups, in males and females, in 12 to 14 years old school children in Bagalkot city. This age group was preferred since most malocclusions are manifested at this time to its full extent.

The prevalence of occlusion in the present study showed that ideal occlusion is found in 3.2%, followed by normal occlusion with 46.8%, class II malocclusion with 30.1%, class I malocclusion with 17.8% and class III with 1.6%. This prevalence was similar to that reported by Shaikh HS[9] in his study on 6 to 13 years children of Mumbai.

Table 1: Distribution of subjects according to molar relation and age							
Molar relation	12 years	%	13 years	%	14 years	%	Total	%
Class I	208	65.41	231	71.96	239	66.20	678	67.80
Class II	97	30.50	87	27.10	117	32.41	301	30.10
Class III	9	2.83	2	0.62	5	1.39	16	1.60
X	4	1.26	1	0.31	0	0.00	5	0.50
Total	318	100.00	321	100.00	361	100.00	1000	100.00

Chi-square: 13.5520; df: 6; p: 0.0350 (S)

Table 2: Distribution of subjects according to molar relation and sex						
Molar relation	Boys	%	Girls	%	Total	%
Class I	356	68.46	322	67.08	678	67.80
Class II	158	30.38	143	29.79	301	30.10
Class III	6	1.15	10	2.08	16	1.60
X	0	0.00	5	1.04	5	0.50
Total	520	100.00	480	100.00	1000	100.00

Chi-square: 6.8640; df: 3; p: 0.0764 (NS)

Table 3: Distribution of subjects according to canine relation and age							
Canine relation	*12 years*	*%*	*13 years*	*%*	*14 years*	*%*	*Total*	*%*
Class I	192	60.38	244	76.01	315	87.26	751	75.10
Class II	32	10.06	33	10.28	37	10.25	102	10.20
Class III	8	2.52	1	0.31	4	1.11	13	1.30
X	86	27.04	43	13.40	5	1.39	134	13.40
Total	318	100.00	321	100.00	361	100.00	1000	100.00

Chi-square: 105.5270; df: 6, p: 0.00000 (HS)

Table 4: Distribution of subjects according to canine relation and sex						
Canine relation	*Boys*	*%*	*Girls*	*%*	*Total*	*%*
Class I	378	72.69	373	77.71	751	75.10
Class II	45	8.65	57	11.88	102	10.20
Class III	5	0.96	8	1.67	13	1.30
X	92	17.69	42	8.75	134	13.40
Total	520	100.00	480	100.00	1000	100.00

Chi-square: 19.2250; df: 3; p: 0.0002 (HS)

Table 5: Distribution of subjects according to overjet and age							
Canine relation	*12 years*	*%*	*13 years*	*%*	*14 years*	*%*	*Total*	*%*
1 (Reverse overjet)	14	4.40	43	13.40	15	4.16	72	7.20
2 (0-4 mm)	241	75.79	220	68.54	315	87.26	776	77.60
3 (5-8 mm)	59	18.55	58	18.07	31	8.59	148	14.80
4 (>8 mm)	4	1.26	0	0.00	0	0.00	4	0.40
Total	318	100.00	321	100.00	361	100.00	1000	100.00

Chi-square: 56.4290, df: 6, p: 0.00000 (HS)

Table 6: Distribution of subjects according to overjet and sex						
Overjet	*Boys*	*%*	*Girls*	*%*	*Total*	*%*
1 (Reverse overjet)	34	6.54	38	7.92	72	7.20
2 (0-4 mm)	400	76.92	376	78.33	776	77.60
3 (5-8 mm)	84	16.15	64	13.33	148	14.80
4 (>8 mm)	2	0.38	2	0.42	4	0.40
Total	520	100.00	480	100.00	1000	100.00

Chi-square: 2.0710; df: 3; p: 0.5579 (NS)

Table 7: Distribution of subjects according to overbite and age							
Canine relation	*12 years*	*%*	*13 years*	*%*	*14 years*	*%*	*Total*	*%*
1	24	7.55	56	17.45	26	7.20	106	10.60
2	246	77.36	240	74.77	316	87.53	802	80.20
3	48	15.09	25	7.79	19	5.26	92	9.20
Total	318	100.00	321	100.00	361	100.00	1000	100.00

Chi-square: 43.6280; df: 4; p: 0.00000 (HS)

Table 8: Distribution of subjects according to overbite and sex						
Overbite	*Boys*	*%*	*Girls*	*%*	*Total*	*%*
1	45	8.65	61	12.71	106	10.60
2	425	81.73	377	78.54	802	80.20
3	50	9.62	42	8.75	92	9.20
Total	520	100.00	480	100.00	1000	100.00

Chi-square: 4.3910; df: 2; p: 0.11134 (NS)

Table 9: Distribution of subjects according to crowding and spacing and age

Crowding and spacing	12 years	%	13 years	%	14 years	%	Total	%
0	33	10.38	44	13.71	33	9.14	110	11.00
1	140	44.03	150	46.73	180	49.86	470	47.00
2	51	16.04	56	17.45	40	11.08	147	14.70
3	12	3.77	18	5.61	14	3.88	44	4.40
−1	66	20.75	38	11.84	85	23.55	189	18.90
−2	15	4.72	15	4.67	9	2.49	39	3.90
−3	1	0.31	0	0.00	0	0.00	1	0.10
Total	318	100.00	321	100.00	361	100.00	1000	100.00

Chi-square: 29.6230; df: 12; p: 0.0031 (S)

Table 10: Distribution of subjects according to crowding and spacing and sex

Crowding and spacing	Boys	%	Girls	%	Total	%
0	31	5.96	79	16.46	110	11.00
1	243	46.73	227	47.29	470	47.00
2	85	16.35	62	12.92	147	14.70
3	31	5.96	13	2.71	44	4.40
−1	109	20.96	80	16.67	189	18.90
−2	21	4.04	18	3.75	39	3.90
−3	0	0.00	1	0.21	1	0.10
Total	520	100.00	480	100.00	1000	100.00

Chi-square: 36.5910, df: 6; p: 0.00000 (HS)

Prasad et al[16] found higher incidence of class I malocclusion (95%) in his study on 5 to 15 years children of Bengaluru, Karnataka. However, Nagaraja Rao[11] found lower prevalence of malocclusion (class I 23%, class II 4.5%, class III 1.3%) in his study on 5 to 15 years old children of Udupi, Karnataka. Slightly higher prevalence of class I malocclusion was found by Sidhu SS[12] in his study on 6 to 30 years old patients seeking orthodontic treatment in Delhi.

Our study shows the prevalence of class III malocclusion to be 1.6%, which is similar to that found by Nagaraja Rao et al,[11] whereas Kharbanda et al[15] found higher prevalence in his study on 5 to 13 years old children of Delhi. Lower prevalence of class III malocclusion was reported by Jacob et al[13,14] in Trivandrum, Prasad et al[16] in Bengaluru. Higher incidence (26.9%) of class III malocclusion was found in study by Tiwari A[8] in 6 to 12 years children of Punjab. Our study showed that prevalence of class II malocclusion to be higher in boys when compared to girls which was similar to that reported by Barry wood[17] in Eskimos and by Mike Isikwe[18] in nigeria. The prevalence of class I malocclusion in our study was higher in boys compared to girls.

The classification of overjet in the present study was taken from the study conducted by Kerosuo H et al[19] because of its simplicity, practicability and validity.

Our study showed that the majority of children in the sample had overjet in the range of 0 to 4 mm (77.6%), followed by 5 to 8 mm range (14.8%), overjet of more than 8 mm was seen in 0.4%. Reverse overjet of all anteriors was seen in 7.2% of the children. AA Singh et al [20] found overjet of 6 to 9 mm in 3.5% in his study on rural school children of Haryana. SP Singh et al[21] found overjet of more than 6 mm in 43% of 12 to 30 years old adolescents of Chandigarh. Jalili et al[22] reported normal overjet (0-6 mm) in 99.5% of 6 to 14 years old children in Mandu, Haryana.

Overjet of 5 to 8 mm is considered abnormal and in our study it was higher in boys (16.1%) compared to girls (13.3%) which was similar to that found by Jalili et al[22] AA Singh[20] found higher prevalence in girls compared to boys in his study on 12 to 16 years children of Haryana.

Majority of the children (80.2%) studied showed the overbite of half or less of the clinical crown, followed by 10.6% showed no overlap (open bite) and 9.2% showed total overlap (deep bite), mandibular incisors in contact with palatal mucosa.

It is difficult to compare our results of overbite with those of other studies as the criteria used for ideal or normal overbite and increased overbite varied.

We found the prevalence of open bite to be 10.6% which is lower compared to that found by SP Singh et al[21] whereas, lower incidence (1.5%) was reported Bhatia and Patel[23] in 3 to 6 years old Gujarati children. The prevalence of deep bite in our study was 9.2% which was very low compared to 26.3% in study conducted by Bhatia and Patel[23] and 12.9% in study conducted by AA Singh et al.[20] Whereas, Jalili et al[22] and Kharabanda et al[15] found lesser prevalence of deep bite.

In our study open bite was found to be higher in girls (12.7%) compared to boys (8.6%) which is similar to that found by Mike Isiekwe[18] whereas, it was opposite in the study carried by Bhatia and Patel.[23] Normal overbite was found to be higher in boys compared to girls, which was similar to that found by Mike Isiekwe[18] whereas, it was higher in girls as reported by AA Singh et al.[20]

The prevalence of crowding in the present study showed that crowding of 1 to 5 mm was found in 47%, 5 to 7 mm was found in 14.7% children and crowding of more than 7 mm was found in 4.4% of the sample. No crowding was found in 11% of the sample size. Whereas, SP Singh et al[21] reported no crowding in 36% in 12 to 30 years old children of Chandigarh.

AA Singh et al[20] found crowding of 4 mm or more in 19.5% in his study on rural schoolchildren of Haryana. Whereas, OP Kharbandaet al[15] found prevalence of crowding to be 27.5% in his study on 10 to 13 years old children of Delhi. SP Singh et al[21] found crowding of 2 to 5 mm in 17.6% in Chandigarh. Crowding of 1 to 5 mm was found to be higher in girls when compared to the boys and this was similar to that reported by AA Singh et al.[20] In our study, the incidence of occlusion that showed no crowding was seen to be higher in females than in males.

The prevalence of spacing of 1 to 5 mm was 18%, spacing of 5 to 7 mm was 3.9% and spacing of more than 7 mm was 0.1%. However; AA Singh et al[20] reported spacing of 26.2% in their study on 12 to 16-year-old rural children in Haryana. SP Singh et al[21] found spacing of 0 to 2 mm in 5%, spacing of 2 to 5 mm in 9% and above 7 mm in 8.7% in 12 to 30-year-old adolescents of Chandigarh, Punjab.

In our study spacing of 1 to 5 mm and spacing of 5 to 7 mm was found to be higher in girls compared to boys which was similar to that found by AA Singh et al[20] in their study on 12 to 16-year-old rural children in Haryana.

The demand for orthodontic treatment is increasing in most of the countries including India. Therefore, rational planning of orthodontic preventive measures on population basis is essential.[24] The benefits of taking orthodontic treatment are to prevention of tissue damage and correction of esthetic component, improve the physical function.[25] The epidemiological data on the prevalence of malocclusion is essential in assessing the resources required for orthodontic services and can also provide valuable information regarding the etiology of malocclusions and other complex traits.[26]

CONCLUSION

1. Majority of the children had class I molar relationship followed by class II and III molar and canine relationship.

2. Majority of the children studied exhibited overjet and overbite between 0 and 4 mm.

3. Two thirds of the children showed crowding whereas; spacing was seen in one-thirds of the children.

4. Age-wise significance was seen with:
   a. Increase in class I canine relationship.
   b. Decrease in overjet of 5 to 8 mm.
   c. Decrease in deep bite (mandibular incisors in contact with palatal mucosa).
   d. Increase of crowding of 1 to 5 mm and decrease in spacing of 5 to 7 mm.

5. Females exhibited significantly higher prevalence rates of class III molar relationship, canine relationships, overjet, open bite and crowding.

CLINICAL SIGNIFICANCE

The study gives the prevalence of malocclusion amongst 12 to 14-year-old in urban Indian population. The data can be used for may research projects and gives us a better understanding of malocclusion in urban Indian population. The epidemiological data on the prevalence of malocclusion is essential in assessing the resources required for orthodontic services and can also provide valuable information regarding the etiology of malocclusions and other complex traits.

REFERENCES

1. Massler M, Frankel JM. Prevalence of malocclusion in children aged 14 to 18 years. Am J Orthod 1951;37:751-68.
2. Newmann GV, Newark NJ. Prevalence of malocclusion in children 6 to 14 years of age and treatment in preventable cases. J Am Dent Assoc 1956;52:566-75.
3. Altemus LA. Frequency of the Incidence of malocclusion in American Negro children aged 12 to 16 years. Angle Orthod 1959;29:189-200.
4. VanKirk LE, Pennel EH. Assessment of malocclusion in population groups. Am J Orthod 1959;45:752-58.
5. Emrich RE, Brodie AG, Blayney JR. Prevalence of class I, II, and III malocclusions (Angle) in an urban population, an epidemiological study. J Dent Res 1964;44:948-53.
6. David B, Carlos J, Naham C. The prevalence and characteristics of malocclusion among senior high school students in upstate New York. Am J Orthod 1965;51:437-45.
7. Erickson DM, Graziano FW. Prevalence of malocclusion in seventh grade children in two North Carolina cities. JADA 1966; 73:124-27.
8. Tewari A. relationship of the incidence of malocclusion with the socioeconomic status of people. J Ind Dent Ass 1966;37:192-200.
9. Shaikh HS, Desai DH. Varieties of malocclusion among orthodontic patients. J Ind Dent Ass 1966;38:1.
10. Boyko DJ. The incidence of primate spaces in fifty, 3-year-old children of the Burlington study. Am J Orthod 1968;54:462- 65.
11. Nagaraja Rao, et al. Oral health status of 500 school children of Udupi. JIDA 1980;52:367-70.

12. Sidhu SS. Incidence of varieties of malocclusion. J Indian Ortho Soc 1968;1:17-20.
13. Jacob PP, Mathew CT. The overbite and overjet relation in different types of occlusion in Kerala. J Ind Orthod Soc 1969; 2:17-23.
14. Jacob PP, Mathew CT. Occlusal pattern study of school children (12-15 years) of Trivandram city. J Ind Dent Ass 1969;41:271-74.
15. Kharbanda OP. What is the prevalence of malocclusion in India? Do we know the orthodontic treatment needs of our country? J Ind Orthod Soc 1999;32:33-41.
16. Rajendra PA, Savadi SC. Epidemiology of malocclusion: A report of a survey conducted in Bangalore city. J Ind Orthod Soc 1971;3:43-55.
17. Wood BF. Malocclusion in the modern Alaskan Eskimo. Am J Orthod 1971;60:344-54.
18. Isikwe MC. Malocclusion in Lagos, Nigeria. Community Dent Oral Epidemiol 1983;11:59-62.
19. Kerosuo H, et al. Occlusion among a group of Tanzanian urban schoolchildren. Community Dent Oral Epidemiol 1988;16: 306-09.
20. Singh AA, et al. Malocclusion and its traits in rural school children. J Ind Orthod Soc 1998;31:76-80.
21. Singh SP, Utreja A, Chawla HS. A study of distribution of malocclusion among North Indians seeking orthodontic treatment. J Ind Orthod Soc 1993;24:47-53.
22. Jalili VP, Sidhu SS, Kharbanda OP. Status of malocclusion in Tribal children of Mandu (Central India). J Ind Orthod Soc 1993; 24:41-46.
23. Bhatia AF, Patel RA. A clinical assessment of deciduous dentition in Gujarati children between 3 to 6 years of age. J Ind Orthod Soc 2004;37:219-31.
24. Bhardwaj VK, Veeresha KL, Sharma KR. Prevalence of malocclusion and orthodontic treatment needs among 16 and 17-year-old school-going children in Shimla city, Himachal Pradesh. Indian J Dent Res 2011 Jul-Aug;22(4):556-60.
25. Shivakumar KM, Chandu GN, Subba Reddy VV, Shafiulla 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;27:211-18.
26. Celikoglu M, Akpinar S, Yavuz I. The pattern of malocclusion in a sample of orthodontic patients from Turkey. Med Oral Patol Oral Cir Bucal 2010 Sep 1;15(5):e791-96.

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