Journal of International Oral Health 2016; 8(12):1105-1109

Received: 29th July 2016 Accepted: 20th October 2016 Conflicts of Interest: None

Source of Support: Nil

Original Research

Doi: 10.2047/jioh-08-12-11

Pattern of Malocclusion in Orthodontic Patients: A Multi Centre Study

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How to cite the article:

Mohanty P, Dany SS, Acharya SS, Sahoo N, Das SK, Chatterjee S, Mohanty D. Pattern of malocclusion in orthodontic patients: A multi centre study. J Int Oral Health 2016;8(12):1105-1109.

Abstract:

Background: There has been a consistent effort and inclined interest of researchers to study varied patterns of malocclusion prevailing in various parts of India, yet the pattern of malocclusion of the orthodontic urban population in Odisha is not well known. The study aimed to ascertain the pattern of malocclusion and to provide quantitative information on the pattern of dentofacial characteristics among urban orthodontic population of Odisha. The objective of the study is to yield information about the variation in pattern and types of malocclusion in the urban orthodontic population in Odisha which in return would benefit the specialist to deliver quality treatment.

Materials and Methods: A prospective hospital-based detailed investigation of 1 year was planned to include both male and female patients having permanent dentition in the age group of 12-30 years visiting the Department of Orthodontics of Kalinga Institute of Dental Sciences, Institute of Dental Sciences, Bhubaneswar and SCB Dental College, Cuttack, Odisha. The descriptive and inferential Pearson Chi-squared and Fisher's exact tests were used to statistically justify the potential differences in the variation of malocclusion.

Results: Out of 1207 subjects, 933 (77.3%) subjects were presented with Angle's Class I malocclusion and 252 (20.88%) subjects were with Angle's Class II malocclusion, whereas Angle's Class III malocclusion was seen only in 22 (1.82%) subjects.

Conclusion: Angle's Class I malocclusion was the most predominant type of malocclusion in this population and Angle's Class III being the least prevalent.

Key Words: Angles's classification, incidence, malocclusion, orthodontic, prevalence, variation

Introduction

As stated by Angle "occlusion is the normal relation of the occlusal planes of the teeth when the jaws are closed"[1] and malocclusion as per Dental Practice Board is justified as an abnormal occlusion, in which teeth are not in a normal position in relation to adjacent teeth in the same jaw and/or the opposing teeth when the jaws are closed.[2] Hereby malocclusion can affect oral health by increasing the prevalence of caries, gingivitis and temporomandibular joint disorders along with affecting the function and esthetics. Hence, with growing modernization and industrialization, there is a greater degree of demand for aesthetics and good oral health. This emphasizes the requirements to obtain knowledge about the prevalence of different types of malocclusion in various populations.

In a vast country like India, malocclusion is a very common finding but its prevalence varies. This variation may be due to the difference in ethnicity, nutritional status, religious beliefs, and dietary habits. The prevalence of malocclusion in India varies from 20% to 43%.[3] Thus, the prevalence assessment studies render a wide knowledge about the proportion and distribution of malocclusion which would serve to assess and determine the exact level of orthodontic care needed in the society.

As there is an absence of any statistical data on the variation of malocclusion in this particular geographical area, the hypothesis of this study was to analyze the pattern of malocclusion of cases reporting to orthodontic centers seeking treatment. This study is the first of its kind as it is an effort to evaluate the pattern of malocclusion among urban orthodontic patients who reported at the Department of Orthodontics of Kalinga Institute of Dental Science (Bhubaneswar), Institute of Dental Sciences (Bhubaneswar) and SCB Dental College (Cuttack), Odisha, India.

Materials and Methods

This prospective cross-sectional hospital-based study was planned from 1st February 2015 to 31st January 2016, which included both male (484) and female (723) patients having permanent dentition in the age group of 12-30 years visiting the Department of orthodontics of Kalinga Institute of Dental Science (Bhubaneswar), Institute of Dental Sciences

(Bhubaneswar) and SCB Dental College (Cuttack), Odisha, India. The inclusion criteria consisted: (i) Patients under ongoing orthodontic treatment with veritable pretreatment records and (ii) patients reporting to the orthodontic department for consultation and willing for treatment. The subjects whose treatment has been completed or having craniofacial anomaly were excluded from the study; also the patients with inadequate pretreatment records were eliminated from the sample.

Before commencement of the study, four examiners (orthodontists) were trained for recording various orthodontic parameters taken into considerations by the gold standard Faculty of Orthodontics and Dentofacial Orthopedics, and they were checked for their interexaminer and intraexaminer variability. Kappa coefficient value for inter-examiner variability ranged from 0.85 to 0.92 for various parameters. For intraexaminer variability Kappa coefficient value ranged from 0.89 to 0.95 for examiner 1 (PM), 0.87-0.93 for examiner 2 (SSA), 0.85-0.92 for examiner 3 (NS), and 0.90-0.96 for examiner 4 (SKD) with respect to different variables. Data collection was based on the written outpatient department records from the Department of Orthodontics and Dentofacial Orthopedics of various dental colleges of Odisha along with the study models and cephalometric radiographs. The study design was approved by the respective college Ethical Committee authorities. Hence, data collection commenced after informed consent was provided to all the patients participating in the study. A qualitative analysis according to Angle's classification to describe the anteroposterior relationship of the maxillary and mandibular first molars during maximum intercuspation.[1] Data were entered into Microsoft office 13 excel sheet and descriptive and inferential statistics as such as Pearson's Chi-square test and Fisher's exact test were used to justify the inference.

Results

Out of 1207 patients who reported to the craniofacial centers of the three institutions, 711 were female and 496 were males. The pattern of malocclusion was 77.3% for Angle's Class I, 9.28% for Angle's Class II Division 1, 11.6% for Angle's Class II Division 2, 1.82% for Angle's Class III (Table 1). Distribution of overjet and overbite was shown in Tables 2 and 3 which illustrated 96.43% of increased overjet in cases with Angle's Class II Division 1. Normal overjet was found in 72.99% cases with Angle's Class I malocclusion and 95.71% cases of Angle's Class II Division 2. The prevalence of the negative overjet of 59.1% which was seen only in Angle's Class III type of malocclusion. Normal overbite was the most common pattern of overbite. Increased overbite was recorded in 58.04% of the patients with Angle's Class II Division 1 type of malocclusion. 31.8% open bite was mostly seen in Angle's Class III cases.

Distribution of spacing in maxillary and mandibular anteriors along with crowding is depicted individually for Angle's Class I, Angle's Class II, and Angle's Class III (Tables 4 and 5). Angle's Class II Division I malocclusion had the highest percent of spacing in maxillary anteriors (27.68%) along with mild crowding (18.75%) (P = 0.03), whereas severe crowding was a prevalent feature of Angle's Class II. Crossbite was more commonly characterized in the anteriors in cases of Angle's Class III malocclusion (59.8%), whereas scissor bite was observed unilaterally only in 2 subjects with Angle's Class III malocclusion with a prevalence of 9.09% (P = 0.80) (Tables 6 and 7).

Table 1: Distribution of malocclusion according to Angle's classification among Orthodontic patients in Odisha

Type	**Number (N)	Percentage (%)	Male (%)	Female (%)
Class I	933	77.3	391 (41.91)	542 (58.09)
Class II	112	9.28	44 (39.29)	68 (60.71)
Class II Div 1*	140	11.6	52 (37.14)	88 (62.86)
Class II Div 2+	252	20.88	96 (38.10)	156 (61.90)
Total				
Class III	19	1.57	08 (42.11)	11 (57.89)
True Class III	3	0.25	01 (33.33)	02 (66.67)
Pseudo Class III	22	1.82	09 (40.90)	13 (59.10)
Total				
Total	1207	100.00	496 (41.09)	711 (58.91)

*Angle's Class II Division 1,+Angle's Class II Division 1, **Number of sample

Discussion

The persistence of malocclusion in our society has its prolonged existence. Determination of factors attributing occlusal problems, need for treatment and their incidence can help to determine the appropriate treatment modality and manpower requirement.[4] Various epidemiological survey-based studies have been published that has illustrated and described the prevalence and types of malocclusion prevailing in a particular geographic area, it is arduous to compare, understand and appreciate the variations recorded between the ethnic groups in part because of the differences in techniques and indices used during evaluation and documentation.

Angle's classification has been used in this study since it is an elementary and unambiguous way to classify malocclusion and is wide spreadly used in dental fraternity notwithstanding the fact that it has been the topic of many discussions in literature.[5] This study showed that 933 out of 1207 patients presented with Angle's Class I malocclusion, i.e. around 77.3% which was much higher than the study done by Trehan *et al.*[6] in Jaipur, North India, with similar sample size of 700 subjects within the age group of 16-25 years (57.9%).

A similar study by Khandelwal *et al.*[7] was conducted on 201 males of Indore, Central India showed incidence of Angle's Class I (69.15%), Angle's Class II Division 1 (18.9%), Angle's Class II Division 2 (27.69%), and Angle's Class III (3.98%). The prevalence of malocclusion studied in Maharashtra,

Table 2: Distribution of overjet among Orthodontic patients in Odisha

Type of overjet	Type of malocclusion**N (%)				Significance
	Class I	Class II		Class III	
		*Div 1	+Div 2		
Normal	681 (72.99)	4 (3.57)	134 (95.71)	1 (4.54)	χ2=1050 p value=0.000*
Increased	212 (22.72)	108 (96.43)	0 (0.00)	0 (0.00)	
Edge to Edge	40 (4.29)	0 (0.00)	6 (4.29)	8 (36.36)	
Negative	0 (0.00)	0 (0.00)	0 (0.00)	13 (59.1)	

*Angles class II Division 1,+Angles class II Division 2, **Number of sample

Table 3: Distribution of overbite among Orthodontic patients in Odisha

Type of overbite	Type of malocclusion**N (%)				Significance
	Class I	Class II		Class III	
		*Div 1	+Div 2		
Normal	530 (56.81)	47 (41.96)	116 (82.86)	14 (63.64)	χ2=99.552 p value=0.000*
Deep bite	348 (37.3)	65 (58.04)	24 (17.14)	1 (4.54)	
Open bite	55 (5.89)	0 (0.00)	0 (0.00)	7 (31.82)	

*Angles class I Division 1,+Angles class II Division 2, **Number of sample

Table 4: The distribution of spacing in various malocclusions in maxillary and mandibular anteriors among Orthodontic patients in Odisha

Arch involved with spacing	Type of malocclusion**N (%)				Significance
	Class I	Class II		Class III	
		*Div 1	+Div 2		
Maxillary Anterior	180 (19.29)	31 (27.68)	0 (0.00)	5 (22.72)	χ2=24.429 p value=0.000*
Mandibular Anterior	106 (11.36)	5 (4.1)	8 (5.71)	0 (0.00)	

*Angles class I Division 1,+Angles class II Division 2, **Number of sample

Table 5: The distribution of severity of crowding in various malocclusions among Orthodontic patients in Odisha

Type of crowding	Type of malocclusion **N (%)				Significance
	Class I	Class II		Class III	
		*Div 1	+Div 2		
Mild	64 (6.86)	21 (18.75)	13 (9.29)	4 (18.19)	χ2=13.453 p value=0.036*
Moderate	67 (7.18)	14 (12.5)	24 (17.14)	3 (13.64)	
Severe	61 (6.54)	11 (9.82)	27 (19.29)	1 (4.55)	

* Angles class I Division 1,+Angles class II Division 2 **Number of sample

Table 6: The distribution of cross bite in various malocclusions among Orthodontic patients of Odisha

Crossbite	Type of malocclusion **N (%)				Significance
	Class I	Class II		Class III	
		*Div 1	+Div 2		
Anterior	57 (6.11)	0 (0.00)	24 (17.14)	13 (59.1)	χ2=31.651 p value=0.000*
Posterior					
Unilateral	23 (2.46)	9 (8.04)	11 (7.86)	1 (4.54)	
Bilateral	6 (0.64)	0 (0.00)	7 (5.00)	0 (0.00)	

*Angles class I Division 1,+Angles class II Division 2, **Number of sample

Table 7: The distribution of scissors bite in various malocclusions among orthodontic patients in Odisha

Scissor bite	Type of malocclusion**N (%)				Significance
	Class I	Class II		Class III	
		*Div 1	+Div 2		
Unilateral	3 (0.32)	1 (0.89)	0 (0.00)	2 (9.09)	χ2=6.750 p value=0.080
Bilateral	0 (0.00)	1 (0.89)	2 (1.43)	0 (0.00)	

*Angles class I Division 1,+Angles class II Division 2, **Number of sample

Western India, by Vibhute[8] on 560 orthodontic patients within the age group of 12-30 years revealed Angle's Class I malocclusion to be 49.1%, followed by Angle's Class II Division 1 malocclusion 34.8%, Angle's Class II Division 2 malocclusion 10.3%, and Angle's Class III malocclusion 5.7%.

It can be seen that Class I malocclusion is more prevalent in India all over in comparison to any other pattern of malocclusion. However, a similar study done in Pakistan by Gul-e-Erum and Fida[9] showed a different result which may be due to the geographical liability to certain malocclusion. It showed the prevalence of Angle's Class I to be 18.6%, Angle's Class II 70.5%, and Angle's Class III 10.9%. A study on the

pattern of malocclusion in Africa (Nigeria) by Onyeaso *et al.*[10] showed that Angle's Class I - 76.5%, Angle's Class II - 15.5%, and Angle's Class III - 8.0% which is quite similar to our study which shows Angle's Class I malocclusion to be 77.3%. Yu *et al.*[11] in South Korea studied trendency of malocclusion on the patient coming to orthodontic department and found 33.3% Angle's Class I malocclusion, 28.2% Angle's Class II malocclusion, and 38.5% Angle's Class III malocclusion. The frequency of Angle's Class III malocclusion seen in Yu *et al.*'s study is much higher (38.5%) when compared to our study (1.82%).

Despite the methodological limitations of a hospital based study, this study is the very the first study of its kind describing the malocclusion pattern of orthodontic patients in Odisha. In this study malocclusion among orthodontic patients, in Odisha was found to be Angle's Class I (77.3%), Angle's Class II (20.88%), and Angle's Class III (1.82%). Angle's Class I malocclusion as in various studies is much prevalent in India. Although according to our study, the incidence is higher when compared to studies done in other states of India. Angle's Class II showed a wide variation result, while the incidence of Angle's Class III was the lowest when compared to various regional and international studies.

This study, incorporated a wide sample consisting of subject willing or undergoing orthodontic intervention thereby, malocclusion was reported to be 100%. As per the study conducted by Gelgör *et al.*[12] 89.9% of the population had malocclusion. The difference might persist because of the dissimilarity in the study design. The prevalence of malocclusion was investigated in general subpopulation, which can be a limitation in our study for lacking a control group with normal malocclusion.

The prevalence of Angle's Class I malocclusion (77.3%) among orthodontic patients, in this study, was more than the data reported by Tausche *et al*[13], Horowitz *et al*[14] and Silva and Kang;[15] all these clinical affirmations signify an increased demand of orthodontic treatment need in Odisha, however, reckoning the prejudicial nature of the sample, the date obtained from this population cannot be implied to the entire state, yet figures as such can act as significant indicator to the prevalence of malocclusion and dentofacial characteristics in the population.

Sayin and Türkkahraman[17] and Sidlauskas and Lopatiene[16] in their research proclaimed that 19% of the study population had Class II Division 1 malocclusion which was notably less than our results. The pattern of Angle's Class II Division 2 (11.6%) was more than the data reported by Gelgör *et al.*[12] (4.7%) as well as Sayin and Türkkahraman[17] (5.0%) and Proffit *et al.*[18] The pervasiveness of Angle's Class III malocclusion (1.8%) is less than prevalences stated by various studies, Thereby, the variation among the prevalences of malocclusions might substantially be related to the difference in the varied gene pool as well as geographical variation or different racial predilections which need to be established by further extensive studies.

The sever crowding was more prevalent in Angel's Class II Division 2 cases (19.29%), while spacing in anterior maxilla was more frequently noticed in Angle's Class II Division 1 malocclusion (27.68%). These results were comparable with the findings of Gelgör *et al.*[12] and Thilander *et al.* In our concurrent study, severe and mild crowding was the most frequent finding in Angle's Class II Division 2.

Tripathy *et al.*[19] reported approximated the distribution and pattern of malocclusion, so as to recognize the potential irregularities in the developing dentofacial complex using Dewey's modification; distribution of Angle's Class I malocclusion was 62.18%, which was less in comparison to our study. Whereas, Nainan *et al.* reported 86.5% angles Class I malocclusion being the most prevalent pattern of malocclusion in the referred orthodontic population of urban India which is in accordance with our study.[20] Rahaman *et al.* concluded that pattern of malocclusion in a Bangladeshi population was prevalently Angles Class I malocclusion (65.53%) and class Angles Class III being least prevalent.[21] Jundi and Riba conducted a prevalence study in Saudi Arabia and concluded Angles Class II malocclusion to be more prevalent followed by angles Class I whereas Class III being least prevalent.[22]

In our study, we concluded that scissor bite was less commonly seen than crossbite and observed in only 9% of the subjects examined mainly with Angle's Class III malocclusion. One explanation for the high rates of crossbite in this study might be that our study evaluated the subjects accepted for orthodontic treatment, but Gelgör *et al.*[12] investigated the referred population and concluded the same.

Although our study did not evaluate, the extremity of the malocclusion that was encountered in the patients willing for orthodontic treatment, and the prevalence of malocclusion of various ethnic races of Odisha. Further investigation in this area appears warranted, including evaluation of orthodontic treatment need and examination of Odisha people of different ethnic background. The rapidly escalating prevalence of malocclusion in the growing Odisha population demands attention from the specialists.

Conclusion

A sample of 1207 including 723 female and 484 male between the ages of 12 and 30 years was analyzed and inspected with Angle's classification system to evaluate the malocclusion pattern among the orthodontic population in Odisha. Angle's Class I malocclusion was utmost prevalent type of malocclusion in this population and Angle's Class III being the least prevalent. No significant gender differences were found for

spacing in the upper and lower arches, whereas severe crowding was a prevalent feature seen in Angle's Class II malocclusion. Normal overbite was the most common pattern of overbite and mostly observed in females and increased overjet was recorded mostly in cases with Angle's Class II Division 1 malocclusion.

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