Research Article

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Prevalence and distribution of dental anomalies of orthodontic patients among North Karnataka, India

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ABSTRACT

Background: Dental anomalies are clinically evident abnormalities which can cause various dental problems, which may complicate orthodontic treatment planning. Clinical and radiological inspection play crucial role in identification of various anomalies. This study was carried over the period of 2.5 years to determine the prevalence and distribution of various morphological dental anomalies among orthodontic patients.

Methods: Demographic details along with detailed medical, dental and family histories were obtained from every patient. In addition to the intraoral examination, dental panoramic radiograph were also evaluated for dental anomalies causing disturbance in number, size, form, and location of teeth. Patients with syndromes were not included in the study.

Results: Out of 678 patients, dental anomalies were present in 161 (23.74%) patients. Hypodontia was the most prevalent dental anomaly occurring in 62 (9.1%). Microdontia was second most prevalent dental anomaly observed in 39 (5.7%). Other anomalies are hyperdontia, macrodontia, transposition, double teeth, taurodontism, Amelogenesis Imperfecta, Dentinogenesis Imperfecta and Dentine Displasia. Overall prevalence of dental anomalies is more common in males (26.45%). Class II malocclusion patients are having highest prevalence rate of dental anomalies followed by class I and class III

Conclusion: Dental anomalies can lead to disturbance in occlusion. Orthodontists and oral radiologist have the responsibility to observe each patient carefully for various dental anomalies and have full knowledge of them as it can help them in planning treatment for these patients and executing them without any complications.

Key words: Dental anomalies, Orthodontic, Malocclusion, Hypodontia, Microdontia

INTRODUCTION

Malformations of the teeth are designated as dental anomalies. Dental anomalies are one of the anomalies of the human structure that result from disturbances during formation of tooth. These dental anomalies including aberrant dimensions, numbers, morphology, and eruption patterns. They can be developmental, congenital or

acquired and may be localized to single tooth or involving systemic conditions.⁴ The developmental anomalies of teeth are caused during tooth development, whereas the acquired anomalies are caused after tooth development.⁵ These dental anomalies, such as impaction, play an effective role in the etiology of different types of malocclusions.⁶ Anomalies affect the occlusion and length of the jaw arch and their

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identification, particularly in the anterior region in young adults, and hence, are extremely important in the aesthetic and orthodontic treatment plan. ^{7,8}

One study reported that multiple congenitally-missing teeth affected the skeletal pattern, whereas other investigation on Japanese orthodontic patients has observed an association of hypodontia and craniofacial morphology. Leifert and Jona have shown an increased prevalence of occlusal deep bite in subjects with palatally-displaced maxillary canines; however, Uslu O et al failed to find statistically significant correlation between dental anomalies and type of malocclusion. 3,11

The difference in the prevalence of dental anomalies in orthodontic patients reported over the past 10 years of publications was very high. Some studies reported prevalence of dental anomalies in orthodontic patient's ranges from 5.46% to 39.5%, while in other survey investigators found that 74.8% prevalence rate. ¹²⁻¹⁶ The possible cause of the variance in these reports might be due to race, sample selection and size, type of dental anomalies and malocclusion.

Although orthodontic patients have been reported to have high rates of dental anomalies, orthodontists often fail to consider this. If not detected, they can complicate dental and orthodontic treatment. Therefore, orthodontists and general dental professional should carefully investigate. Difference in the wide range of prevalence rate from different studies representing persons of various ethnic origins. However, a study representing the dental anomalies in orthodontic patients has not been done so far. Therefore this study was conducted to determine the prevalence rate dental anomalies in orthodontic patients.

METHODS

This cross sectional study was conducted on all patients, older than 14 years who visited four multispecialty dental clinics in North Karnataka region from February 2013 to August 2015.

Detailed medical, dental and family histories were obtained for all subjects. The selection criteria follow:

- No significant medical history, such as significant trauma to the jaw bones.
- No history of metabolic disorders or syndrome affecting bone metabolism and/or tooth formation.
- No history of extraction or previous orthodontic treatment
- No cleft lip and/or palate, craniofacial anomalies and diagnosed syndromes.
- Good quality panoramic radiographs.
- Complete root formation of all permanent teeth appeared on panoramic radiographs (except third molar).

Six hundred seventy eight patients who fulfilled the inclusion criteria formed the sample of the present study. Demographic details like age, sex, type of malocclusion were obtained from every patient. In addition to the intraoral examination, dental panoramic radiograph were evaluated for the presence of any dental anomaly with agreement between an orthodontist and oral radiologist.

The criteria presented by Soames JV et al were used for the descriptions of anomalies. Following dental anomalies were assessed¹⁷:

- Disturbance in number of teeth (hypodontia & hyperdontia).
- Disturbance in size of teeth (macrodontia & microdontia).
- Disturbance in location of teeth (Transposition).
- Disturbance in form of teeth (taurodontism & double tooth).
- Disturbance in structure of teeth (amelogenesis imperfecta, dentinogenesis imperfecta, dentine displasia)

All the records were examined by single investigator. Intra-examiner reliability was tested by re-examining the random patients, a month after initial examination to ensure the diagnostic consistency. Data tabulation and analysis was processed using SPSS software version 20.

RESULTS

The present study was performed for evaluation of prevalence and distribution of dental anomalies and other findings in the group of 678 orthodontic treatment patients, which composed of 223 males (32.8%) and 455 females (67.1%). Age ranged between 13 and 27 years (mean 20.56±2.36). The patients were grouped into: class-I 305 (44.9%), class-II 252 (37.1%) and class-III 121 (17.8%).

Of 678 patients, 161 (23.74%) exhibited at least one dental anomaly, while 517 patients (76.25%) showed no dental anomalies. The frequencies of selected anomalies, sex distribution and statistical differences between sexes, as well as the most prevalently involved teeth are shown in Table 1 and Figure 1.

Differences in prevalence rates of each dental anomaly by sex were analyzed by using chi-square test and the related P values were calculated for each anomaly. No statistically significant correlation were found between dental anomalies and patient's gender, with the exception of hypodontia (p=0.01), which were significantly higher in females and males.

Table 2 and Figure 2 depict the frequencies of selected anomalies, distribution of types of malocclusion and statistical difference between different types of malocclusion. Differences in prevalence rates of each dental anomaly by types of malocclusion were analyzed by using chi-square test and the related P values were

calculated for each anomaly. No statistically significant correlation were found between dental anomalies and

malocclusion, with the exception of hypodontia (p=0.01), which were significantly higher in females and males.

Table 1: Prevalence and distrubution of dental anomalies among males and females orthodontic patients.

Anomalies	Males (n=223)	Females (n=455)	Total (n=678)	p-value
Hypodontia	15 (6.7%)	47 (10.3%)	62 (9.1%)	0.001^{*}
Microdontia	12 (5.3%)	27 (5.9%)	39 (5.7%)	0.341
Hyperdontia	9 (4.03%)	6 (1.31%)	15 (2.2%)	0.673
Macrodontia	5 (2.2%)	7 (1.53%)	12 (1.76%)	0.344
Transposition	5 (2.2%)	5 (1.09%)	10 (1.4%)	0.278
Double teeth	5 (2.2%)	3 (0.65%)	8 (1.17%)	0.632
Taurodontism	2 (0.89%)	4 (0.87%)	6 (0.88%)	0.834
Amelogenesis Imperfecta	4 (1.79%)	1 (0.21%)	5 (0.7%)	0.531
Dentinogenesis Imperfecta	2 (0.89%)	1 (0.21%)	3 (0.44%)	0.752
Dentine Displasia.	0 (0%)	1 (0.21%)	1 (0.14%)	0.478
Total	59 (26.45%)	102 (22.41%)	161(23.74%)	0.562

Table 2: Prevalence and distrubution of dental anomalies among different malocclusions.

Anomalies	Class I (n=305)	Class II (n=252)	Class III (n=121)	Total (n=678)	p-value
Hypodontia	18 (5.9%)	41 (16.2%)	3 (2.4%)	62 (9.1%)	0.001^{*}
Microdontia	22 (7.2%)	15 (5.9%)	2 (1.6%)	39 (5.7%)	0.546
Hyperdontia,	9 (2.9%)	3 (1.19%)	3 (2.4%)	15 (2.2%)	0.478
Macrodontia,	8 (2.6%)	2 (0.7%)	2 (1.6%)	12 (1.76%)	0.342
Transposition	7 (2.2%)	1 (0.3%)	2 (1.6%)	10 (1.4%)	0.761
Double teeth	5 (1.6%)	1 (0.3%)	2 (1.6%)	8 (1.17%)	0.289
Taurodontism,	4 (1.3%)	1 (0.3%)	1 (0.8%)	6 (0.88%)	0.782
Amelogenesis Imperfecta,	2 (0.6%)	2 (0.7%)	1 (0.8%)	5 (0.7%)	0.589
Dentinogenesis Imperfecta	2 (0.6%)	1 (0.3%)	0 (0%)	3 (0.44%)	0.827
Dentine Displasia.	1 (0.3%)	0 (0%)	0 (0%)	1 (0.14%)	0.784
Total	78 (25.5%)	67 (26.5%)	16 (13.2%)	161 (23.78%)	0.634

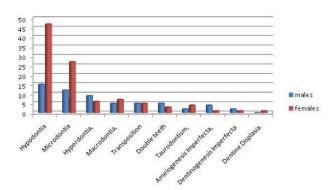


Figure 1: Prevalence and distribution of dental anomalies among males and females orthodontic patients.

Hypodontia was the most common dental anomaly in the present study followed in descending order by microdontia, hyperdontia, macrodontia, transposition, double teeth, taurodontism, amelogenesis imperfecta,

dentinogenesis imperfecta and dentine displasia. The distribution of various anomalies is outlined in Figure 3. *Hypodontia* accounted for 9.1% (15 males and 47 females) of the patients. Maxillary lateral incisors were most frequently missing teeth followed in decreasing order by maxillary third molars, mandibular third molars and mandibular second premolars.

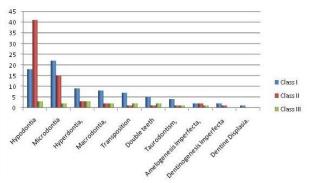


Figure 2: Prevalence and distribution of dental anomalies among different malocclusions.

Microdontia was observed in 5.7% of patients (12 males and 27 females). Maxillary third molars and mandibular incisors were the most commonly affected teeth. There was 39 (5.7%) cases of microdontia, most common affected teeth is maxillary third molar followed by maxillary laterals. Microdontia is very common in maxilla compared to mandible.

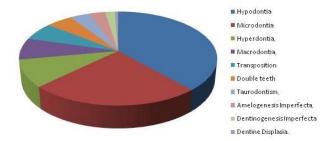


Figure 3: Prevalence of dental anomalies in orthodontic patients.

Hyperdontia, including supernumerary tooth and mesiodens, was seen in 15 (2.2%) patients. The occurrence of macrodontia (1.76%) was less common than microdontia. The most common type of macrodontia presented at the third molar, followed by the second premolar and the first premolar.

Prevalence rate *of transposition* of teeth seen in this study is 1.4%. Most common transposition is between maxillary lateral incisor and canine. There were 8 (1.17%) cases of double tooth seen in this study. Most common double tooth is seen in between mandibular laterals followed by mandibular canine and premolar. Other anomalies like double tooth, amelogenesis imperfecta, dentinogenesis imperfecta and dentine displasia found to be <1% in this study.

DISCUSSION

In spite of there are many investigations done to explore the prevalence of different dental anomalies but only few studies conducted on orthodontic patients.^{3,12,18,19} Till date no studies conducted to probe the prevalence of dental anomalies in this region.

The present study shows 23.74% prevalence of dental anomalies in orthodontic patients. This result is higher compare to other study conducted by Rathi M, et al and Khan SQ. 15,20

Although the prevalence and distribution of dental anomalies has been studied in various groups of orthodontic patients, the discrepancies in the various results have been attributed to racial differences, variable sampling techniques and different diagnostic criteria including the orthodontic problem selected.

Dental agenesis has been reported to be the most common anomaly in the development of the human dentition and the prevalence of hypodontia varies greatly from 0.03% to 10.1% in various populations.²¹ While Kruthika S, et.al in an investigation on 20,182 Indian patients reported hyperdontia as most frequent anomaly in their study.²²

Hypodontia was the most prevalent dental anomaly in the present study which is 9.1%. This result supports the findings of some of previous study. 3,12-14,18. The order of most commonly congenitally missing teeth after third molars are mandibular second premolars, maxillary lateral incisors and maxillary second premolars. But in this study, maxillary lateral incisor was found to be the most commonly missing permanent tooth followed by mandibular second premolar. These results are in accordance with study conducted by Kennedy DB et al. 26

Microdontia was second most prevalent dental anomaly observed in 38 (5.7%) patients with the maxillary lateral incisor being the most commonly affected tooth. The prevalence of microdontia ranges from 0.8% to 8.4% in various populations.²⁷ Third molars vary in size more frequently than any other teeth followed by maxillary lateral incisors which is consistent with our study.²⁸ The prevalence of microdontia had been reported to increase over time. This was attributed to the rate of evolution, local environmental factors and criteria in selecting the study groups. ^{12,29}

The prevalence of hyperdontia in the present study is 15 (2.2%) which is consistent with the other study. A significant difference was observed in other studies like Uslu O et al reported the prevalence of 0.3% in Turkey, GuptaZS et al reported the prevalence of 0.62% in India, Zhu KF et al found the prevalence of hyperdontia ranged from 1% to 3% among the white population. This may be explained by the different part living, local environment, nutrition, inclusion criteria, diagnostic criteria, and study design.

Macrodontia is a rare abnormality of teeth and very much less common than microdontia. In the present study, we found 1.76% of macrodontia which is in accordance with other studies. ¹⁵ Usually in cases where macrodontia exists, only one or two teeth are larger than normal size. Maxillary central incisor was found to be the most commonly affected tooth, which is in agreement with previous studies conducted. ³²

Transposition, an uncommon dental anomaly involving positional interchange of the two teeth, was observed in 1.4% of the patients in this study which is slightly higher than other studies. Maxillary lateral-canine transposition was the most common form of transposition in our study. But other studies reveled that transposition is more common in maxillary canines and first premolars. S5,36

A taurodont usually presents with elongated pulp chambers having greater apico-occlusal height and lacking constriction at cement-enamel junction level.¹ The prevalence of taurodontism has been reported to range between 5.67 and 60% of subjects.³⁷⁻³⁹ In the present study, 1.17% of the patients showed taurodontism. The difference might arise from racial differences because it is commonly observed among the Eskimos and Natives of Australia and Central America or differences in diagnostic criteria.²²

Other anomalies like double tooth, amelogenesis imperfecta, dentinogenesis imperfecta and dentine displasia found to be <1% in this study which is hardly seen in the other studies.

Some investigations revealed that no malocclusion group had a statistically significant relationship with multiple dental anomalies but in present study only hypodontia is statistically significant relationship with dental anomalies. Same studies showed dental anomalies are more common in class- I followed by class- II and class-III. But our studies show that dental anomalies are more common in class-II followed by class-I and class-III. The possible explanation may be in our study class-II samples are more compared to previous studies and prevalence rate of class-I and class-II is almost same.

CONCLUSION

Prevalence and distribution of some dental anomalies in North Kanataka, India orthodontic patients differed from other studies. Orthodontists should concern about the difference in dental anomalies in various group of patients. Careful diagnosis simplify treatment plan and reduce complications.

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Ethical approval: The study was approved by the

Institutional Ethics Committee

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