Prevalence of microdontia among orthodontic patients of Kathmandu, Nepal

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ABSTRACT

Background: Microdontia is a condition where the teeth are smaller than the normal size, which may involve all teeth or be limited to a single tooth or a group of teeth. The objective of this study was to find out the prevalence of microdontia among orthodontic patients of Kathmandu, Nepal.

Methods: In this cross-sectional study, 390 orthodontic casts of patients (166 males and 224 females) who came for orthodontic treatment between the age of 14 to 22 years (mean age of 17.43 ± 4.28 years) were selected. The mesiodistal dimension of each tooth was recorded with the help of digital vernier caliper. A tooth was diagnosed as microdontia when it is smaller than the normal size. Data analysis was performed using SPSS version 21.0 with a confidence level set at 95% ($P<0.05$). Chi-square test was used to determine the difference in prevalence of microdontia among the genders. Whereas, mesio-distal dimensions of teeth were compared on both sides of the jaws using student's t-test.

Results: The prevalence of overall microdontia was 6.66% (26) whereas prevalence of single tooth microdontia, multiple teeth and generalized microdontia was 2.3% (9), 2.83% (11) and 1.53% (6) respectively. There was no statistical difference in the prevalence of microdontia among genders ($p=0.987$). In addition, there was no statistical difference in the mesio-distal dimensions of teeth on both sides of the jaws ($p>0.05$).

Conclusion: Microdontia was one of the common dental anomalies present among the orthodontic patients. The most common tooth affected by microdontia was maxillary lateral incisor and microdontia affects the maxillary teeth more than the mandibular teeth. There was no statistically significant difference in prevalence of microdontia among genders.

Keywords: Microdontia, Nepal, Orthodontic patients, Prevalence

INTRODUCTION:

Microdontia is a developmental anomaly where the teeth are smaller than the normal size (i.e. outside the usual limits of variation) [1]. It may involve all teeth or limited to a single tooth or a group of teeth. It can be classified into- single tooth microdontia, relative microdontia and generalized microdontia [2].

The prevalence of microdontia ranges from 0.7 to 30.1% [3-7]. Microdontia of maxillary lateral incisor is also known as "peg lateral", which is the commonly affected tooth and female showed higher frequency in compared to male [8,9]. Peg lateral is usually associated with other dental anomalies [10,11].

Abnormalities in tooth size result from disturbances during morpho-differentiation stage of tooth development. Microdontia are also associated with some syndromes [12]. Many studies have variable results and a wide prevalence range, besides less evidence was reported about the frequency of microdontia in our population. So, the aim of this study was to assess the prevalence of microdontia among orthodontic patients of Kathmandu, Nepal.

METHODS

This cross-sectional study comprised of pretreatment casts of the orthodontic patient from the records archive of Department of Orthodontics and Dentofacial Orthopedics, Tribhuvan University Teaching Hospital, Kathmandu, Nepal who came for the orthodontic treatment from January 2021 to December 2022. Sample size for this study was determined by using this formula- $n = Z^2 pq/d^2$, where Z = 1.96, value of p is taken as 0. 5, q=1-p=0.5, allowable error (d) = 0.05 and n is required sample size. Based on these parameters, the required sample size was 384.16. Hence, total 390 samples were selected. Non probability (purposive) sampling was used to select the samples.

This study was approved by the Institutional Review Committee of Institute of Medicine before commencement of the study [Ref. 486 (6-11) E^2 079/080].

Inclusion criteria were good quality pre-treatment casts of the patients having all teeth erupted except the third molars between 14-22 years of age who came for the orthodontic treatment. The casts of the patient who had previous orthodontic treatment and had systemic disease or craniofacial anomalies were excluded from this study.

All pretreatment dental casts of the patients were evaluated for dental microdontia. The mesiodistal dimension of each tooth from second molar of one side to another side of both arches was recorded with the help of digital vernier caliper (Digimatic Eco, Precise, India) in millimeters (Fig. 1). A tooth was diagnosed as microdontia when the mesiodistal tooth diameter (width) is more than 2 SD below mean value. Reference values of mesiodistal dimension were taken from the previous Nepalese study by Shrestha [13].
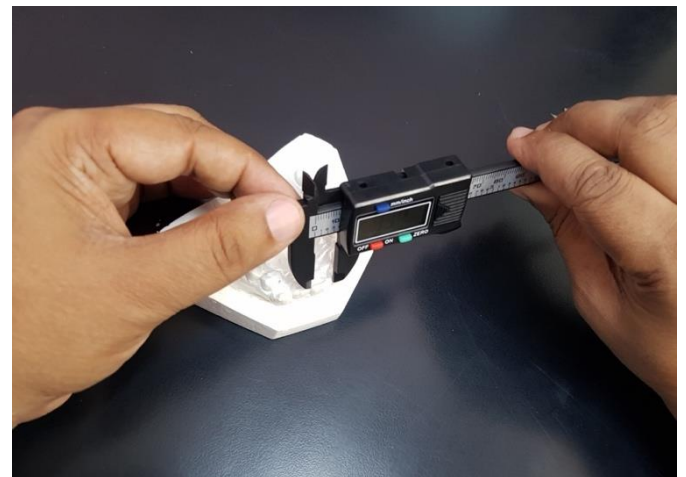

Fig. 1 Measuring the mesio-distal dimension of tooth using digital vernier caliper

It was categorized in to three categories [12]- single tooth microdontia, multiple teeth microdontia and generalized microdontia. In single tooth microdontia, only one tooth is smaller than normal size whereas in multiple

teeth microdontia, more than one tooth is involved with microdontia and in generalized microdontia, all the teeth are smaller than the normal size.

Data obtained were transferred to a Microsoft Excel spreadsheet. To test for significance, the data were verified and analyzed statistically using Statistical Package for the Social Sciences (SPSS) Statistics Version 21.0 (Armonk, NY: IBM Corp.) with a confidence level set at 95% (P < 0.05). The prevalence of microdontia among orthodontic patients was descriptively analyzed. Pearson's Chi-square test was applied at 5% significance level to investigate the prevalence of microdontia among the genders. The mesio-distal dimensions of teeth in patients who were not affected by microdontia were compared on both sides of the jaws using student's t-test.

RESULTS

In this cross-sectional study, 390 orthodontic casts of orthodontic patients who came for the orthodontic treatment from the age of 14-22 years (mean age of 17.43 ± 4.28 years) were selected out of which 166 were males and 224 were females (Fig. 2).
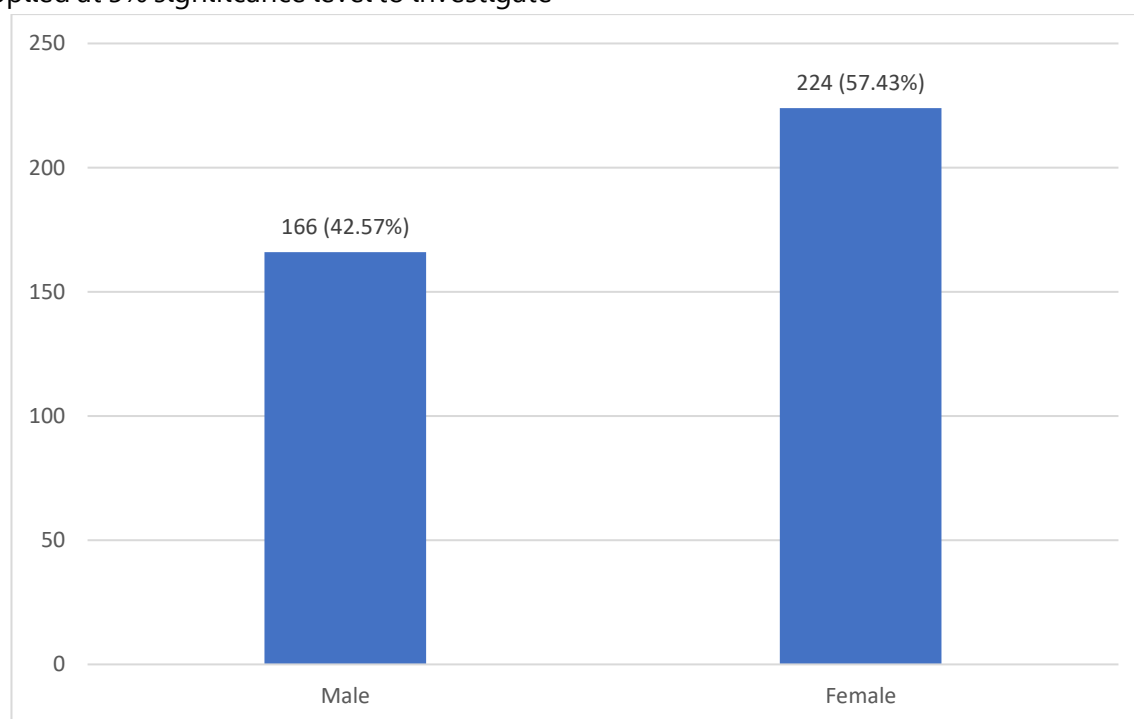
Fig. 2 Frequency of gender distribution

The distribution of patients with and without microdontia along with the gender comparison are clearly demonstrated in Table 1. Chi-square test showed that there was no statistically difference in the distribution of males and females among patients with microdontia and without microdontia (p=0.396).

The prevalence of different types of microdontia in orthodontic patients and its comparison among the genders are demonstrated in Table 2.

Chi-square test revealed there was no statistical difference in the prevalence of different types of microdontia among genders (p=0.987). It was found that maxillary lateral incisor was the most common tooth affected by microdontia in compared to other teeth. Along with this, microdontia affects the maxillary teeth more than the mandibular teeth.

Table 1: Distribution of microdontia among genders in orthodontic patients.

Gender	Patient with microdontia	Patient without microdontia	p-value (Chi-square)
Male	9 (34.61%)	157 (43.13%)	
Female	17 (65.39%)	207 (56.87%)	0.396
Total	26 (100%)	364 (100%)	
*P<0.05= Statistically significant difference			

Table 2: Prevalence and comparison of different types of microdontia among genders in orthodontic patients

Anomalies	Males	Females	Total	p-value (Chi-square)
Single tooth Microdontia	3 (0.76%)	6 (1.53%)	9 (2.3%)	
Multiple teeth microdontia	4 (1.02%)	7 (1.79%)	11 (2.83%)	0.987
Generalized microdontia	2 (0.51%)	4 (1.02%)	6 (1.53%)	
Total microdontia	9 (2.3%)	17 (4.35%)	26 (6.66%)	
*P<0.05= Statistically significant difference				

The mesio-distal dimensions of teeth in patients who were not affected by microdontia were compared on both sides of the jaws using student's t-test (Table 3). It showed there was no statistical difference in the mesio-distal dimensions of teeth on both sides of the jaws in patients who were not affected by microdontia (p>0.05).

Table 3: Mesiodistal dimension of tooth among orthodontic patients who were not affected by microdontia

Type of Jaws	Type of tooth	Mesio-distal dimention of tooth		p-value (t-test)
		Right (Mean±S.D.)	Left (Mean±S.D.)	
Maxillary	Central incisor (I_1)	8.76±0.475	9.05±1.944	0.500
	Lateral Incisor (I_2)	7.15±0.990	7.04±0.659	0.466
	Canine (C)	7.96±0.552	8.42±2.362	0.180
	First Premolar (P_1)	7.42±1.150	7.28±0.524	0.457
	Second Premolar (P_2)	7.04±0.458	7.48±2.796	0.449
	First Molar (M_1)	10.48±0.972	10.34±0.439	0.449
	Second Molar (M_2)	9.14±0.361	9.25±0.614	0.352
Mandibular	Central incisor (I_1)	6.53±5.466	5.69±0.459	0.500
	Lateral Incisor (I_2)	6.25±0.404	6.86±3.992	0.500
	Canine (C)	7.98±5.549	7.14±0.406	0.446
	First Premolar (P_1)	7.21±0.500	7.85±4.161	0.500
	Second Premolar (P_2)	8.19±5.836	7.31±0.521	0.411
	First Molar (M_1)	10.85±0.663	11.52±3.924	0.309
	Second Molar (M_2)	9.651±0.431	9.781±0.382	0.241
*p<0.05= Statistically Significant				

DISCUSSION

In this study, we have evaluated the prevalence of microdontia in patients coming for an orthodontic treatment as it was lacking in our population. Microdontia is a developmental anomaly resulting from the defect in morpho-differentiation stage of tooth development.

The maxillary and mandibular teeth must be proportional in size to achieve a good occlusion with the normal overjet and overbite [14]. Microdontia might affects the esthetic of the patients as well as it alters the tooth size proportion between the maxillary and mandibular teeth so it should be considered in the orthodontic treatment planning. There are various causative factors for the microdontia including genetics, environmental factors and syndromes. Microdontia is a permanent condition, and the teeth will not grow larger on their own. It's important to note that the specific treatment approach for a patient with microdontia will vary based on individual factors, including the severity of the condition, the patient's oral health, and their treatment goals.

In this study, the prevalence of microdontia was 6.66% which is similar to the study by Tongkoom et al which reported 6.3% of prevalence in Chinese children [15]. Our prevalence finding is more than the study by Roslan et al [3] which showed prevalence of 1.08% among Malaysian orthodontic patients whereas it is lower than the study by Pedreira et al [4] that showed the prevalence of 30.1% in Brazilian orthodontic patients and Khan et al [12] which showed the prevalence of 30% in Pakistani orthodontic patients. The prevalence of different types of microdontia such as single tooth microdontia, multiple teeth and generalized microdontia is also lower than the study by Khan et al [12]. The prevalence study of dental anomalies by Gupta et al [7] revealed only 2.16% of prevalence of microdontia among the Nepali orthodontic patients but this study was not based on the cast samples and not evaluated the different types of microdontia and its distribution. This wide range of variation in its prevalence may be due to geographical, racial and genetic differences as well as differences in the sample size. The higher prevalence of microdontia in this study may be due to the reason that orthodontic patients were evaluated rather than the normal population.

In our study, the most common tooth affected by microdontia was maxillary lateral incisor which is in accordance with the study by Laverty and Thomas [16], Garib et al [17] and Khan et al [18]. Maxillary lateral incisor is considered the most common teeth affected by the developmental anomalies as it is also reinforced by the previous study [19] conducted among Nepalese orthodontic patients which showed that the most common tooth affected by hypodontia is maxillary lateral incisor.

This study showed no statistical difference in the prevalence of microdontia among the genders which is in accordance with the study by Tongkoom et al [15]. This finding is contradictory with the study by Pedreira et al [4] and study by Laverty and Thomas [16] that showed it is the female who are mostly affected with the microdontia.

In addition, there was no statistical difference in the mesio-distal dimensions of all teeth on both sides of the jaws in patients who were not affected by microdontia (p>0.05). This finding is similar to the study by Jaiswal et al [20]. In contradictory to this, study by Shrestha [13] showed significant difference in the mesiodistal dimension of lower incisors, maxillary first molar and second molars between the right and left sides.

The present study findings may vary amongst diverse ethnic groups and populations. Thus, multicenter collaborative studies in diverse populations with healthy controls by including larger sample size are recommended for comprehensive assessment.

CONCLUSION

Microdontia was one of the common dental anomalies present among the orthodontic patients. The most common tooth affected by

microdontia was maxillary lateral incisor and microdontia affects the maxillary teeth more than the mandibular teeth. There was no statistically significant difference in prevalence of microdontia between male and female. Microdontia can influence the esthetics of the patients as well as it alters the tooth size proportion between the maxillary and mandibular teeth so it should be addressed during the orthodontic treatment cautiously.

Ethical Approval: This study was approved by the Institutional Review Committee of Institute of Medicine before commencement of the study [Ref. 486 (6-11) E^2 079/080].

Conflict of interest: The authors declare that they have no conflicts of interest.

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Data Availability statement: Data can be made available upon request.

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