

Influence of the size of incisors on the occurrence of crowding

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ABSTRACT

Aim: The aim of the study was to determine the influence of the size of permanent incisors on the appearance of the crowding of the anterior segment of dental arches.

Materials and Methods: The study included 100 subjects, aged 13-25 years. All the examinees were divided into two groups. The first group comprised 50 subjects (25 males and 25 females) who had marked symptoms of crowding, especially in the anterior segment. The second group comprised 50 subjects (25 males and 25 females) with normal occlusion. The measurement was performed using a digital caliper, 0.01 mm of accuracy. The following parameters were examined: mesiodistal (MD) and labiolingual (LL) diameter of the maxillary and mandibular incisors. The index of the crown of the tooth was calculated using the formula $(MD/LL) \times 100$.

Results: The results of this study show that the mesiodistal diameter and the index of the crown of upper and lower incisors has a significantly higher value in both male and female in crowding compared with normal occlusion. In this study, the higher values of the index of tooth crown in patients with crowding, may be due to greater mesiodistal diameter of teeth.

Conclusion: The results of this study suggest that increased tooth size has a contributory role in dental crowding.

Key Words: influence of the size, incisors, crowding (Bangladesh Journal of Orthodontics and Dentofacial Orthopedics, October 2012, Vol. 3, No. 1, p 24-29)

INTRODUCTION

Tooth size means the mesiodistal widths of the maxillary and mandibular teeth.¹ Mesiodistal width of tooth is an important factor in orthodontic diagnosis and treatment planning.² To achieve optimal occlusion, the maxillary and mandibular teeth must be proportional in size. If there is mismatched, there is no way to achieve optimum occlusion.³

The size of teeth is one of the crucial factor affecting occlusion. It differs among individuals, varies with different races, peoples, and ethnic groups.⁴⁻⁸

Members of various races, peoples and ethnic groups show differences in teeth size. Negroids have bigger teeth than Caucasoids⁴⁻⁸ while in yellow race, the size of teeth is slightly smaller compared to the white race.⁹ In determining teeth size, ethnic variations must be considered as well.^{6,10,11} Crowding is the irregularities of teeth due to inadequate space in the arch for normal alignment usually manifested by imbrication, displacement, impaction, rotation & tilts etc. Dento-alveolar disproportion (tooth size & arch dimension) is one of the important causes of crowding. Narrow dental base, short antero-posterior dental base & large teeth greatly influence the crowding.¹²

Numerous authors who have analyzed the relationship

between the size of teeth and dental arches, on one side, and the degree of crowding, on the other, report that the size of teeth is important for the appearance of crowding.¹³⁻¹⁹ However, there are those who claim that it is not the size of teeth that affects the appearance of crowding but the size of dental arches.²⁰⁻²²

The present study was to determine the extent to which the tooth size of permanent incisors on the appearance of the crowding of the anterior segment of dental arches.

OBJECTIVES OF THE STUDY

General:

1. To determine the influence of the size of permanent incisors on the appearance of the crowding of the anterior segment of dental arches.

Specific:

1. To compare the Mesiodistal (MD) diameter of incisors in normal occlusion and crowding.
2. To compare the Labiolingual (LL) diameter of incisors in normal occlusion and crowding.
3. To compare the index of the crown $(MD/LL) \times 100$ of incisors in normal occlusion and crowding.

MATERIALS AND METHODS

Sample selection

The study using 100 pair of study models divided into two groups (crowded and normal occlusion). Each group consisted of 50 pair of study models were equally divided between the gender (25 males and 25 females). In case of crowded group, we select patients with primary crowding that was evident in both arches of the anterior segment. The models were selected from out patient department of Dhaka Dental College and Hospital seeking treatment of malocclusion (crowded group) and students of Dhaka Dental College and Hospital (normal occlusion).

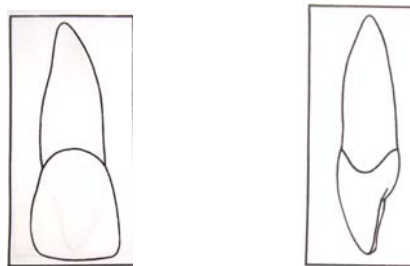
Study procedure

Each of the subjects was selected in respect of inclusion and exclusion criteria. A case history sheet with Model Analysis for each subject was filled.

Data collection

The following measurements were done on the study models:

1. The mesiodistal diameter of incisors on each model from lateral incisor to lateral incisor were measured with digital calipers, 0.01 mm of accuracy. Beaks of the digital calipers were placed parallel to the long axis of teeth, from its mesial contact point to its distal contact point at its greatest interproximal distance.²³ Fig. 1
2. The labiolingual diameter of teeth was also measured by placing the beaks of the digital calipers parallel to the long axis of each tooth at cingulum.²⁴ The maximum labiolingual diameter of four incisors was usually found at height convexity of cingulum . Fig. 1
3. The index of the crown was calculated for all teeth of the upper and lower jaws using the formula (MD/LL) × 100.



Mesio-distal diameter

Labio-lingual diameter

Figure-1. Showing diagrammatic representation of maximum mesiodistal diameter and labio-lingual diameter of tooth respectively.

DATA PROCESSING

After collection of data, the obtained data was checked and verified. These were entered in a personal computer using the SPSS (statistical package for social science) software. The obtained results were processed on a computer by applying the basic statistical parameters: mean value (x), standard deviation (SD) and span of minimum and maximum values. Differences between sexes and the examined groups (crowding and normal occlusions) were tested using a t-test.

RESULT

This study was a analytical & comparative study conducted among the models of 100 patients and students of Dhaka Dental College and Hospital. The occlusion of these patients was crowded & normal occlusion. Mesiodistal diameter, labiolingual diameter and Index of the crown were calculated for each individual models of crowded and the corresponding normal occlusion groups under study. The statistical tests to be used for analysis of data was t- test. In this analytical test the level of significance p value <0.05 was considered significant.

Comparative analysis of normal occlusion and crowding

Table:-1 Differences in mesiodistal diameter of upper permanent incisors in males with normal occlusions and crowding

Tooth	Group	N	Mean(x)	SD	CV	Min-Max	p value
U1	Normal occlusion	25	8.61	0.47	5.46	7.77-9.43	0.0030**
	Crowding	25	9.07	0.57	6.28	8.23-10.14	
U2	Normal occlusion	25	6.73	0.50	7.42	6.05-7.54	0.0001**
	Crowding	25	7.43	0.44	5.92	6.52-8.25	

U1= Upper central incisor. U2= Upper lateral incisor
 L1= Lower central incisor.L2= Lower lateral incisor
 SD= Standard deviation.CV= Coefficient of variation

$$CV = \frac{SD}{Mean} \times 100$$

Min-Max = Minium value & maxium value of each tooth

The mesiodistal diameter of the upper central and lateral incisors shows significantly higher values in patients with crowding compared to those with normal occlusion (t-test, p < 0.05).

Table:-2 Differences in mesiodistal diameter of lower permanent incisors in males with normal occlusions and crowding

Tooth	Group	N	Mean(x)	SD	CV	Min-Max	p value
L1	Normal occlusion	25	5.34	0.39	7.30	4.56-6.10	0.0047**
	Crowding	25	5.69	0.43	7.56	4..70-6.38	
L2	Normal occlusion	25	5.89	0.42	7.13	5.25-6.83	0.0017**
	Crowding	25	6.26	0.37	5.91	5.40-6.98	

L1= Lower central incisor.L2= Lower lateral incisor

The mesiodistal diameter of the lower incisors in male subjects is significantly greater in persons with crowding compared to normal occlusions (t-test, $p < 0.05$).

Table:-3 Differences in mesiodistal diameter of upper permanent incisors in females with normal occlusions and crowding

Tooth	Group	N	Mean(x)	SD	CV	Min-Max	p value
U1	Normal occlusion	25	8.27	0.67	8.10	6.74-9.98	0.0001***
	Crowding	25	9.02	0.55	6.10	7.83-10.10	
U2	Normal occlusion	25	6.63	0.59	8.89	5.48-7.62	0.003**
	Crowding	25	7.30	0.61	8.35	6.22-8.58	

The mesiodistal diameter of the upper incisors in female subjects also shows significantly higher values in patients with crowding (t-test , $p < 0.05$).

Table:-4 Differences in mesiodistal diameter of lower permanent incisors in females with normal occlusions and crowding

Tooth	Group	N	Mean(x)	SD	CV	Min-Max	p value
L1	Normal occlusion	25	5.30	0.29	5.47	4.61-6.10	0.0008***
	Crowding	25	5.70	0.46	8.07	4.91-6.66	
L2	Normal occlusion	25	5.80	0.36	6.20	5.28-6.55	0.0011***
	Crowding	25	6.20	0.45	7.25	5.29-7.23	

The mesiodistal diameter of the lower incisors in female subjects also shows a high level of significance of differences in favor of subjects with crowding (t-test $p < 0.05$).

Table:-5 Differences in labiolingual diameter of upper permanent incisors in males with normal occlusions and crowding

Tooth	Group	N	Mean(x)	SD	CV	Min-Max	p value
U1	Normal occlusion	25	7.46	0.49	6.57	6.59-8.46	0.6891
	Crowding	25	7.52	0.54	7.18	6.40-8.28	
U2	Normal occlusion	25	6.80	0.38	5.58	6.13-7.46	0.8346
	Crowding	25	6.77	0.53	7.82	5.68-7.62	

Table:-6 Differences in labiolingual diameter of lower permanent incisors in males with normal occlusions and crowding

Tooth	Group	N	Mean(x)	SD	CV	Min-Max	p value
L1	Normal occlusion	25	6.43	0.49	7.62	5.25-7.50	0.1722
	Crowding	25	6.26	0.36	5.75	5.47-6.74	
L2	Normal occlusion	25	6.72	0.47	6.99	5.84-7.78	0.1443
	Crowding	25	6.52	0.46	7.05	5.66-7.75	

The labiolingual diameter of the upper and lower incisors in male subjects is greater in normal occlusion than those with crowding, although some variation was found only upper central incisor. But this difference is statistically insignificant ($p > 0.05$).

Table:-7 Differences in labiolingual diameter of upper permanent incisors in females with normal occlusions and crowding

Tooth	Group	N	Mean(x)	SD	CV	Min-Max	p value
U1	Normal occlusion	25	6.98	0.61	8.74	5.51-8.28	0.0407*
	Crowding	25	7.32	0.52	7.10	5.90-8.28	
U2	Normal occlusion	25	6.20	0.54	8.70	5.34-7.10	0.0017**
	Crowding	25	6.71	0.52	7.74	5.76-7.93	

Table:-8 Differences in labiolingual diameter of lower permanent incisors in females with normal occlusions and crowding

Tooth	Group	N	Mean(x)	SD	CV	Min-Max	p value
L1	Normal occlusion	25	6.04	0.69	11.42	5.15-8.81	0.8791
	Crowding	25	6.02	0.46	7.64	5.03-6.84	
L2	Normal occlusion	25	6.19	0.35	5.65	5.38-6.94	0.3561
	Crowding	25	6.30	0.45	7.14	5.53-7.03	

The labiolingual diameter of the upper and lower incisors in female subjects is greater in crowding than those with normal occlusion, although some variation was found only at lower central incisor. But this difference is statistically significant only for upper incisors ($p < 0.05$).

Table:-9 Differences in the Index of the crown of the upper permanent incisors in males with normal occlusions and crowding

Tooth	Group	N	Mean(x)	SD	CV	Min-Max	p value
U1	Normal occlusion	25	115.38	5.44	4.71	103.88-123.55	0.0110**
	Crowding	25	120.99	9.08	7.50	108.84-140.29	
U2	Normal occlusion	25	99.43	7.88	7.92	86.57-118.76	0.0001***
	Crowding	25	110.23	8.77	7.95	94.49-126.31	

The index of the crown of the upper incisors in males shows significantly higher values in subjects with crowding compared to subjects with normal occlusion ($p < 0.05$).

Table:-10 Differences in the Index of the crown of the lower permanent incisors in males with normal occlusions and crowding

Tooth	Group	N	Mean(x)	SD	CV	Min-Max	p value
L1	Normal occlusion	25	83.39	4.81	5.77	72.19-91.10	0.0001***
	Crowding	25	91.07	7.17	7.87	78.04-105.01	
L2	Normal occlusion	25	87.35	5.23	5.98	74.90-97.09	0.0001***
	Crowding	25	96.33	7.25	7.52	84.90-112.01	

The index of the crown of the lower incisors in male subjects is significantly higher in persons with crowding compared to normal occlusions ($p < 0.05$).

Table:-11 Differences in the Index of the crown of the upper permanent incisors in females with normal occlusions and crowding

Tooth	Group	N	Mean(x)	SD	CV	Min-Max	p value
U1	Normal occlusion	25	118.53	9.64	8.13	102.70-140.11	0.0580
	Crowding	25	123.52	8.50	6.88	107.42-139.88	
U2	Normal occlusion	25	107.55	13.82	12.84	85.37-137.36	0.6124
	Crowding	25	109.40	11.70	10.89	92.06-128.25	

The index of the crown of the upper incisors in females also shows higher values in subjects with crowding compared to subjects with normal occlusion. But this difference is statistically insignificant ($p > 0.05$).

Table:-12 Differences in the Index of the crown of the lower permanent incisors in females with normal occlusions and crowding

Tooth	Group	N	Mean(x)	SD	CV	Min-Max	p value
L1	Normal occlusion	25	89.20	7.14	8.00	78.02-106.46	0.001**
	Crowding	25	94.51	7.86	8.32	79.97-113.27	
L2	Normal occlusion	25	93.84	7.42	7.90	82.99-108.92	0.0317*
	Crowding	25	98.69	8.05	8.15	83.70-111.79	

The index of the crown of the lower incisors in females is also significantly higher in subjects with crowding compared to normal occlusions ($p < 0.05$).

DISCUSSION

The results of comparative analyses show that persons of both sexes with crowding have a significantly bigger mesiodistal diameter of the upper and lower incisors, when compared with persons with normal occlusion. This result coincides with the result of our previous study in the department of Orthodontics and Dentofacial Orthopedics at Dhaka Dental College and Hospital by Jahan H (2010) under supervision of Hossain MZ.²⁵ The findings of our study also coincide with the findings of a large group of authors who have studied the interrelationship of tooth size, arch size and dental crowding and found a significant correlation between the mesiodistal widths of the maxillary mandibular incisors and dental crowding, which indicates that the size of teeth is of importance for the appearance of crowding.¹³⁻¹⁹

In the present study, male subjects with normal occlusion have a bigger vestibulo-lingual diameter of the upper and lower incisors, compared to males with crowding, except upper central incisor. But this difference is statistically insignificant (Table:11,12). This results correlates with the result of Peck H and Peck S (1972) in respect to lower incisors.²⁴ In female subjects with crowding have a bigger vestibulo-lingual diameter of the upper and lower incisors, compared to females with normal occlusion, except lower central incisors. But this difference is statistically significant only for upper incisors. This result coincides with the result of Mirjana Janosevic et al. 2006.²⁶ Examining the mandibular incisor crowding and dimensions of the incisors, some authors assume that there is no significant interrelation between the labiolingual diameter of teeth and crowding, which coincides with the findings we obtained for female subjects.²⁷

In the present study, in both males and females, the index of the crown of the upper and lower incisors is significantly higher in persons with crowding compared to normal Occlusion, except upper lateral incisor. This result coincides

with the result of Mirjana Janosevic et al. 2006.²⁶

In this study the subjects with crowding has a significantly higher values of the mesiodistal diameter and the index of the crown of the upper and lower incisors in males and females in compare with normal occlusion. Our findings suggest higher values of the index of teeth crown in patients with crowding, which is the consequence of a greater mesiodistal diameter of teeth. These results also coincide with the findings of Little RM. 1975.²⁷

From the above discussions it is assumed that tooth size has a greater role in developing crowding which reject the hypothesis of this study.

CONCLUSION

Based on the results of examining the size of incisors in patients with crowding and persons with normal occlusion, in conclusion followings are suggested :

1. The results of this study show that size of teeth is one of the major factors in the occurrence of crowding of dental arches.
2. Persons of both sexes with crowding are characterized by significantly higher mesiodistal diameter of all upper and lower incisors.
3. In both males and females, the index of the crown of the upper and lower incisors is significantly higher in persons with crowding compared to normal occlusion, except upper lateral incisor.

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