The relation between the mesio-distal crown widths of the deciduous second molars and the permanent first molars

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ABSTRACT

Background: This study aimed to find whether there is a relation between the mesio-distal crown diameters of the deciduous second molars and the permanent first molars in an Iraqi sample from Baghdad city.

Material and methods: The sample consisted of 54 Iraqi children aged 8-9 years at the mixed dentition stage. The measurements included the mesio-distal crown width of the deciduous second molars and the permanent first molars on the study casts using digital sliding vernier.

Results: The results revealed absence of the side difference of the widths of teeth measured. High significant gender difference was detected for the permanent first molars and the deciduous second molars except mandibular permanent first molar. On the other hand, high significant difference was found between the maxillary and mandibular arches for the permanent first molars and the deciduous second molars except for the permanent first molar in males. A direct strong significant correlation was found between the width of the permanent first molars and the deciduous second molars.

Conclusion: The findings of the present study may be used as predictive factor for tooth – jaw disharmony and the possibility for the crowding in the future.

Keywords: Mesio-distal crown width, permanent first molars, deciduous second molars. (J Bagh Coll Dentistry 2014; 26(3):113-117).

INTRODUCTION

Odontometrics is the biometric science that studies tooth size. It is used in anthropology, archeology, dentistry and forensic dentistry [1]. The mesio-distal crown diameter of teeth is an important factor which affects the alignment of teeth in the bony arches and the development of occlusion during transition of the dentition [2].

Several studies found that the tooth size in humans is determined by polygenic genetic factors [3-5] meaning that several genes subjected to environmental influences are involved. The way that the dental size inherited is a largely unknown process. The most important factor is hereditary.

From the anthropological perspective, the determination of tooth size and form is useful for comparing the current population with previous civilizations given that variations in tooth size can be correlated with different customs, lifestyles and eating habits, as well as variations in the phylogenetic scale of human races [6,7].

The most widely studied crown dimension in the literatures is the mesio-distal diameter. This dimension is important for normal occlusion as it determines the dental-bone discrepancy because dental dimension and bone dimension must be in accordance to achieve correct alignment and occlusion [8]. Few studies done to measure the mesio-distal width of the deciduous dentition in Iraq, most of these studies frequently relate the size of deciduous teeth to those of permanent teeth [9,10].

The permanent first molar is the first permanent tooth to erupt in the oral cavity at the age of six years old child distal to the second deciduous molars. It is the largest tooth of the oral cavity and the tooth of greatest biomechanical relevance [11] and it is the most dimorphic teeth of the permanent dentition [12]. With regard to the deciduous second molar, it should be noted that this is the tooth with the largest mesio-distal diameter of the deciduous dentition and it is almost an exact copy of the permanent first molar, but of smaller size [11]. This morphological concordance between the deciduous second molar and the permanent first molar is called isomorphism by some authors, and it can be used as a guide to predict the appearance of the permanent first molar of the same quadrant.

This study aimed to find whether there is a relation between the mesio-distal crown diameters of the deciduous second molars and the permanent first molars in an Iraqi sample from Baghdad city.

MATERIALS AND METHODS

Sample

Out of 250 children at age of 8-9 years old examined from different primary schools in Baghdad city with different socioeconomic status, only 54 children (27 males and 27 females) were selected who fitted the inclusion criteria of the present research. The exclusion criteria were the followings:

1. Presence of caries or loss of dental material for any reason.
2. Presence of abnormalities of size, shape, or structure.

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3. Presence of proximal restorations.
4. Teeth that had not erupt sufficiently to be able to measure the maximum mesio-distal diameter.
5. Technical defects in the study models.

Methods

The mesio-distal width of each molars were measured at the widest distance between the contact points on study dental cast obtained from alginate impressions for each child [2,13,14]. A fine tipped digital sliding vernier (Insize Company) with an accuracy of ±0.02 mm. was used to perform the measurements held parallel to the occlusal plane.

Statistical analyses

Statistical analyses were carried out using the SPSS software. The descriptive statistics including means, standard deviations, maximum and minimum values of the mesio-distal width for the permanent first molars and deciduous second molars. Inferential statistics included independent sample t-test to test the genders differences and paired sample t-test to compare between measurements of contra-lateral teeth.

In order to study the relation between the width of the deciduous second molar and the width of the corresponding permanent first molar, the teeth were classified into 3 categories according to the mesio-distal crown diameter: normal, large, and small. These categories were based on the following considerations.

Normal: within the range mean size ±1 standard deviation.

Large: more than 1 standard deviation above the mean size.

Small: more than 1 standard deviation below the mean size.

The percentages of the sample of molars that could be classified as normal, small, or large according to their mesio-distal crown diameters were determined separately for each of the deciduous second molars and the permanent first molars. An analysis was then performed to determine whether there was a relationship between the size of the deciduous second molar and the corresponding permanent first molar based on the above classification, this relationship was performed using Pearson's correlation coefficient test.

RESULTS

Mesio-Distal Crown Diameters (MDCD)

The descriptive statistics of the MDCD of the permanent first molars and deciduous second molars for the males and females groups in the maxillary and mandibular arches for each sides (right and left sides) were presented in (table 1).

Table 1: Descriptive statistics of the mesio-distal width of the measured teeth in both genders

Teeth	Males (N= 27)				Females (N= 27)			
	Mean	S.D.	Min.	Max.	Mean	S.D.	Min.	Max.
UR6	10.50	0.41	9.6	11.3	10.06	0.53	9.2	10.8
UL6	10.50	0.46	9.4	11.5	10.04	0.53	9.2	10.9
LR6	10.62	0.63	8.6	11.9	10.53	0.42	9.6	11.3
LL6	10.60	0.61	8.7	11.7	10.52	0.42	9.8	11.2
URE	9.20	0.44	8.3	9.9	8.78	0.46	8	9.6
ULE	9.14	0.43	8.3	9.8	8.76	0.47	8	9.8
LRE	9.79	0.58	8.7	11.4	9.45	0.51	8.3	10.5
LLE	9.84	0.59	8.6	11.6	9.48	0.49	8.3	10.5

Side Difference (Right vs. Left)

As presented in table 2, non-significant differences were found between the right and left sides of the maxillary and mandibular teeth using the paired sample t-test. So, the readings of the right and left sides were merged to be one reading for each tooth.

Table 2: Sides' difference in both genders

Teeth	Males (d.f.=26)		Females (d.f.=26)	
	t-test	p-value	t-test	p-value
UR6 vs. UL6	-0.082	0.936 (NS)	0.848	0.404 (NS)
LR6 vs. LL6	0.586	0.563 (NS)	0.901	0.376 (NS)
URE vs. ULE	2.054	0.052 (NS)	0.961	0.345 (NS)
LRE vs. LLE	-1.637	0.114 (NS)	-1.369	0.183 (NS)

Gender Difference

Generally, males had greater MDCD than females. Independent sample t-test revealed that there was a high significant difference between males and females in the maxillary permanent first molars and the deciduous second molars, while there was a non-significant genders difference in the permanent mandibular first molars (Table 3).

Table 3: Descriptive statistics and genders difference of the mesio-distal width of the measured teeth

Teeth	Males (N=54)		Females (N=54)		Total (N=108)		Genders difference (d.f.=106)	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	t-test	p-value
U6	10.50	0.43	10.05	0.53	10.28	0.53	4.901	0.000 (HS)
L6	10.61	0.61	10.52	0.42	10.57	0.52	0.846	0.400 (NS)
UE	9.17	0.43	8.77	0.47	8.97	0.49	4.648	0.000 (HS)
LE	9.82	0.58	9.47	0.49	9.64	0.57	3.389	0.001 (HS)

Arch differences

Table 4 showed the comparison between the MDCD of the maxillary and mandibular permanent first molars and deciduous second molars in both genders and in overall sample using independent sample t-test. The results revealed a high significant difference between the maxillary and mandibular molars except for maxillary permanent first molars in males which showed non-significant difference.

Table 4: Descriptive statistics and dental arches' difference of the mesio-distal width of the measured teeth in both genders and total sample

Genders	Teeth	Maxillary		Mandibular		Arch dimensions		
		Mean	S.D.	Mean	S.D.	t-test	d.f.	p-value
Males	6	10.50	0.43	10.61	0.61	-1.056	106	0.294 (NS)
	E	9.17	0.43	9.82	0.58	-6.557	106	0.000 (HS)
Females	6	10.05	0.53	10.52	0.42	-5.204	106	0.000 (HS)
	E	8.77	0.47	9.46	0.49	-7.535	106	0.000 (HS)
Total	6	10.56	0.53	10.29	0.53	3.739	214	0.000 (HS)
	E	9.49	0.60	9.12	0.59	4.628	214	0.000 (HS)

Classification the size of the measured teeth

Table 5 showed the frequencies and percentages of permanent first molars and deciduous second molars that could be classified as normal, small and large according to their MDCD for the males, females and the total sample.

Table 5: Frequency and percentage of the cases that have been classified as normal, small and large according to their mesio-distal diameter in both genders and total sample

Size	Arch	Tooth	Males		Females		Total	
			No.	%	No.	%	No.	%
Normal	Maxillary	6	44	81.48	33	61.11	74	68.52
		E	38	70.37	39	72.22	75	69.44
	Mandibular	6	41	75.93	36	66.67	77	71.30
		E	41	75.93	34	62.96	84	77.78
Small	Maxillary	6	6	11.11	9	16.67	21	19.44
		E	8	14.81	4	7.41	10	9.26
	Mandibular	6	5	9.26	8	14.81	14	12.96
		E	8	14.81	6	11.11	8	7.41
Large	Maxillary	6	4	7.41	12	22.22	13	12.04
		E	8	14.81	11	20.37	23	21.30
	Mandibular	6	8	14.81	10	18.52	17	15.74
		E	5	9.26	14	25.93	16	14.81

Relation between the MDCD of permanent first molars and deciduous second molars

The correlation between the width of the permanent first molars and the width of the

deciduous second molars of each category in both genders and the overall sample was presented in table 6. Generally, there was direct strong significant correlation between the width of the permanent first molars and the width of the deciduous second molars with respect to each arch

Table 6: Relation between the mesio-distal width of the permanent first molars and deciduous second molars of each category in both genders and total sample

Correlation	Males			Females			Total		
	Normal	Small	Large	Normal	Small	Large	Normal	Small	Large
r	0.962	0.922	0.927	0.857	0.821	0.818	0.915	0.760	0.660
p-value	0.000	0.009	0.032	0.000	0.003	0.002	0.000	0.011	0.014
r	0.974	0.993	0.721	0.954	0.872	0.912	0.974	0.890	0.971
p-value	0.000	0.001	0.016	0.000	0.024	0.000	0.000	0.003	0.000

DISCUSSION

Mesio-distal crown diameter (MDCD) also called tooth size provides significant information on human evolution and biological problems as well as in forensic and clinical dentistry. Anthropologists used the mesio-distal diameter to draw the evolution of tooth size; also tooth size provides a perception of connection between populations and environmental adaptation. The relationship between tooth size and dental crowding is reported by authors as being an important factor in clinical practice [15].

The mesio-distal diameter of the tooth is represented by the greatest distance between the mesial and distal points of contact using a precision caliper orientated parallel to the occlusal and vestibular surfaces. This technique described by Moorrees *et al.* [2] to measure the mesio-distal crown diameter of the teeth, this technique has been used in many studies [5,8,12,17-19].

Out of 250 children examined, only 54 children were included in this study because of the high incidence of dental caries among school age children and particularly inter-proximal caries in the deciduous second and permanent first molars at this age [16].

In the present study, the mesio-distal crown diameters measurements were performed on dental models obtained from alginate impressions for the selected sample [2-5,12,14]. In some studies the measurements of the mesio-distal diameter of the primary and permanent teeth were performed directly in the mouth of the individual' but the measurement of maxillary molars directly in the mouth presented certain difficulties due to anatomical factors and that, in general, measurements performed intra-orally are smaller than those obtained from plaster models [19].

However; other studies used both techniques (direct and indirect) in their odontometric study of deciduous dentition, demonstrating that there were no statistically significant differences between the two methods of measurements [20].

From the results of present the study (Tables 1 and 2), the MDCD of teeth in the right side were non-significantly larger than the left side except the mandibular second deciduous molars were the left side was larger insignificantly than the right side. This comes in accordance with other studies [2,5,9,17,21]. However, Tejero *et al.* [8] found significant differences between right and left teeth for the deciduous maxillary second molars.

According to this, the left and right sides were merged and genders comparison was performed using independent sample t-test which revealed high significant genders difference for second deciduous molars and maxillary first molar. Mandibular first molar showed non-significant difference; this finding agreed with the study of Yuen *et al.* who found sexual dimorphism only for the maxillary molars [5]. However, the pattern appears to be more variable because some studies did not observe sexual dimorphism for the maxillary second molars [8,23], while other studies found significant gender differences in the width of the deciduous second molars [3,16,21,24,25].

Comparing the MDCD between the maxillary and mandibular molars of both genders and the overall sample revealed a high significant difference between arches except for maxillary permanent first molar (table 4), and this come in accordance with many studies [9,10,22].

The percentage of first permanent molars and second deciduous molars that could be classified as normal, small and large according to their mesio-distal diameter for the males, females and the overall sample respectively were presented in Table 5. The highest frequency and percentage were presented for the normal size molars.

Applying the Pearson's correlation coefficient test revealed that there was direct strong significant correlation between the width of the permanent first molars and the width of the deciduous second molars in each arch. The present finding indicated that if a dental arch had large deciduous second molars, the permanent first molars will be large also [13]. This will

provides the orthodontist and pedodontist with information about the size of the permanent first molars at an early age.

The similarity between deciduous second molars and permanent first molars, estimated from the present study, can be used as a predictive factor of tooth-jaw size disharmony of the permanent dentition, i.e. whenever the deciduous second molars have large mesio-distal crown diameter means that the permanent first molars will be erupted large too.

The conclusions that can be drawn from this study are:

1. No significant difference was detected between right and left sides for the permanent first molars and the deciduous second molars.
2. High significant difference was detected between the males and females for the permanent first molars and the deciduous second molars except mandibular permanent first molar.
3. High significant difference was found between the maxillary and mandibular arches for the first permanent molars and the second deciduous molars except for the permanent first molar in males.
4. A concordance was found between the sizes of the deciduous second molars with the size of the permanent first molars, this finding may be used as predictive factor for tooth-jaw disharmony which may result for possible crowding in the permanent dentition.

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