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Maxillary Dental Arch Dimensions in a Sample of Iraqi Children at the Mixed Dentition Stage

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Abstract

The purpose of this study was to estimate the maxillary arch dimensions in a selected sample of Iraqi children from Baghdad city at the mixed dentition stage, aged 8 – 9 years. Measurements were picked out from 50 study models for the whole selected sample using Auto sketch computerizing program, then The data collected were subjected to a statistical analysis. The results show that the mean values of maxillary arch dimensions of Iraqi children represent a median between North American and Indian samples. The mean values for both maxillary arch lengths and widths for the children of the present study shows lower values than that estimated from previous Iraqi studies done on older age groups, the findings of this study can be used as a basis for future Iraqi studies in other cities of Iraq rather than the capital for the same age group.

Key words: Maxillary dimensions, Mixed dentition, Study models.

Introduction

Information concerning maxillary dental arch dimensions in human populations is of great value to clinicians in different fields of dentistry (orthodontics, pedodontics, prosthodontics and oral surgery) and it is of interest to anthropologists to study the growth and development of the dental arch for different population. [1-2] Numerous studies have been made to study the dental arch dimensions at the permanent dentition stage ,[1,3-14] who measure both arches (maxillary & mandibular),and some measures the maxillary arch alone, using different materials from wax pattern to study models and photos, the methods that they use varies from manual, templates to more accurate digital measurements. The previous measurements were done on different populations for both

genders from different countries and predominantly were done on adult samples.

Others measure the arch dimensions through the measurements of the mesiodistal width of the primary dentitions [15,16]. Few of them select the mixed dentition stage [17,18] and measure the width & length of both maxillary or mandibular arches dimensions and they were concerned with the measurement of the mesiodistal crown diameter ' or to measure the buccal segment among their populations. Both of them conclude, just like many that there were no significant differences between the mean values of the right and left sides of the arches for both genders, nevertheless still males posses a higher mean values than females

however , the significant difference were found between maxillary & mandibular arches. [17-19].

The present study was conducted among 8-9 years old primary school children from Baghdad city belonging to different socioeconomic status. At this age the children are at the mixed dentition stage in which we find the permanent central incisors and the first permanent molars, the deciduous canines, first and second molars [20,21] at which there's no or very minimal growth horizontally or anteroposteriorly within the dental arches. The data collected from both genders were gathered together in the selected sample of the present study from the maxillary arch alone.

The aim of this study is to measure some of the maxillary dental arch dimensions in a sample of Iraqi children 8-9 years at the mixed dentition stage and since few previous Iraqi studies were conducted to measure the maxillary dental dimensions at this age, therefore the data gathered could provide an important information for this age group, and can be compared later on with similar data collected from different populations and at the same time compared with similar Iraqi data at different age groups.

Materials & Methods

The sample of the present study consists of 50 Iraqi healthy children (25 males and 25 females) ranging in age between 8-9 years, at the mixed dentition stage, belonging to a mixed socioeconomic status selected from different primary schools from Baghdad city.

The criteria for selection of the sample were as follows:

1- Children had complete set of dentition at the mixed dentition stage.

2- Healthy dentition with no extensive caries, malformation.

3- Children had no history of orthodontic treatment or space maintenance therapy.

Dental study models were prepared by taking alginate hydrocolloid impressions for each child with perforated metal trays, pouring it with dental stone according to the manufacturing instructions, then for every dental cast a proper plaster base was made and trimmed then labeled with certain number [22].

Study Models Measurements Figure (1).

Maxillary dental arch widths" horizontal" measurements include:

1- *(IC)*: inter-canine distance which extends between the cusp tips of right and left canine (and / or the centers of the facets of the weared primary canines).

2- *(IM)* : inter-molar distances which are represented by 4 distances :

  i- *(MB)*: the distance between the mesiobuccal cusp tips of right and left first permanent maxillary molars.

  ii- *(ML)* : the distance between the mesiolingual cusp tips of right and left first permanent maxillary molars.

  iii- *(DB)* : the distance between the distobuccal cusp tips of right and left first permanent maxillary molars.

  iv- *(DL)* : the distance between the distolingual cusp tips of right and left permanent maxillary molars.

While the maxillary dental arch length" vertical" measurements include four distances which are :-

1- (A) The distance between the contact points of the permanent central incisors to the line tangent to the cusp tip of the primary

canines (or when worn, to the centers of resulting facets)

2- (*B*) The distance between the contact points of the permanent central incisors to the line tangent to the distal surfaces of the deciduous first molars .

3- *(C)* The distance between the contact points of the permanent central incisors to the line tangent to the distal surfaces of the deciduous second molars.

4- (*D*) The distance between the contact points of the permanent central incisors to the line tangent to the distal surfaces of the permanent first molars.

Each of these landmarks were marked on the study casts by a sharp lead pencil to facilitate accurate recognition, then the occlusal surface of study casts were facing the glass window of the scanner directly, then accurate & exact image of the casts were saved and transferred to the Auto sketch program on Pentium 4 computer according to the instruction read from that software program, the Auto sketch (Germany) software provides a complete set of CAD tools for creating professional-quality precision drawing, such software program were accurately used in many other dental measurements. [12]

Results

All the variables of the maxillary dental arch dimensions for the studied sample for both genders were subjected to the descriptive statistics (mean, Minimum, Maximum, range and standard deviation).

Table (1) demonstrates the maxillary dental arch widths measurements, which shows that the mean values of the maxillary dental arch widths at IC were 33.98mm and the MB, ML, DB and DL distances were 50.79mm, 40.66mm, 52.68mm and 41.99mm respectively.

Table (1) shows that the distolingual distance has the widest range while IC distance has the narrowest range.

Table (2) demonstrates the measurements of the maxillary dental arch lengths which shows that the mean values of the maxillary dental arch lengths at A,B,C and D were found to be 9.13mm, 19.31mm, 28.07mm and 38.11mm respectively.

It can be noticed that D has the highest mean value while A has the least mean value .

Discussion

Arch width:

This study shows that the mean values of maxillary intercanine distance (IC) at the mixed dentition stage for Iraqi children at 8-9 years old age less mean values than the mean values of other populations like African of nearly the same age group [17], and this can be postulated to wide type of the arch form of the African populations than those of Iraqi populations and this fact come in accordance with previous Iraqi studies that made such comparisons [23] , but at a different age group. Furthermore, the measurements were done on a single arch regardless to the type of occlusal relations that shows a significant differences in the arch width and forms among the Iraqi populations,[23,24]. The maxillary intercanine distance in our study showed that there is a nearly equal value to that of the Cardiff longitudinal survey done on an 11 years Caucasian populations (33.06 ± 3.33 mm)[25] in spite of the difference in the age factor with our sample, keeping in our mind a fact that there is a very minimal horizontal growth or no growth occur in the dental arches between eight to

eleven years of age [26,27], Furthermore the differences in arch distances between populations could be related to the texture of foods consumed and the frequency of the eating events which affects the development of the dental arches.

From tab.1, figure 2 we can see that the range and the standard deviation of the distolingual intermolar distance (DL) is higher than those of the rest of the horizontal intermolar distances which can be attributed to the fact that the distolingual cusp is smaller in size or less developed when compared to the other three cusps of the maxillary permanent first molar, which makes the identification of this cusp tip variable [20] in a way that we recommend that in the future studies of the same type , it is prPeferable not to use this point as a landmark for more accuracy, in spite of most studies and textbooks recommend the use of lingual landmarks[20,28] .But when comparing the (MB) distance of this study with those of Caucasian[25] (50.14 ± 2.41 mm), we discover that the measurements of this study again is nearly equal to them, despite the difference in the age group, and it's explanation is the same as that of (IC). [26, 27]

Arch Length:

The arch lengths at A,B,C and D were found to be 9.13mm, 19.31mm, 28.07mm and 38.11mm respectively fig. (1) tab (2) ,and when comparing these mean values of the maxillary dental arch lengths at A, B, C, & D distances with other population like Indians, [29] 10.14mm, 20.86mm, 29.89mm, and 39.75mm, the Iraqi mean values shows nearly the same lengths of that to the Indian except the distance at the canine region (A), and this minor difference could be attributed to the type of the maxillary arch forms of both populations and the relative mesiodistal dimension of the

deciduous and permanent teeth[15,20,23,24,,29,30] .

A definite results of this study is that the mean values of all the parameters that we measures are less than those of older ages 13- 15- 17 years [4,12], and this is related to the growth factors.

Conclusion

The objective of this study was to obtain the maxillary arch dimensions (width and length) of Iraqi children 8-9 years of age at the mixed dentition stage and to compare the findings of the present study with other studies of various populations at the same age group, and to compare with other studies at different age groups. The present study illustrates the following aspects :

The Iraqi maxillary arch dimensions were nearly equal to the Caucasian populations horizontally, and slightly lower than that of Indian populations anteroposteriorly .

While the maxillary arch dimension of Iraqi children of the present study shows lower values when comparing with other Iraqi studies but at older age group samples.

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Table (1) : Maxillary dental arch width in millimeters.

	No	Mean	Min	MAX	range	+ SD
IC	50	33.98	29.95	35.88	5.93	1.424
MB	50	50.79	47.41	54.04	6.63	1.843
ML	50	40.66	37.31	43.81	6.50	1.836
DB	50	52.68	48.83	55.87	7.04	1.751
DL	50	41.99	37.93	52.29	14.36	3.351

Table (2) Maxillary Dental Arch Length in millimeters.

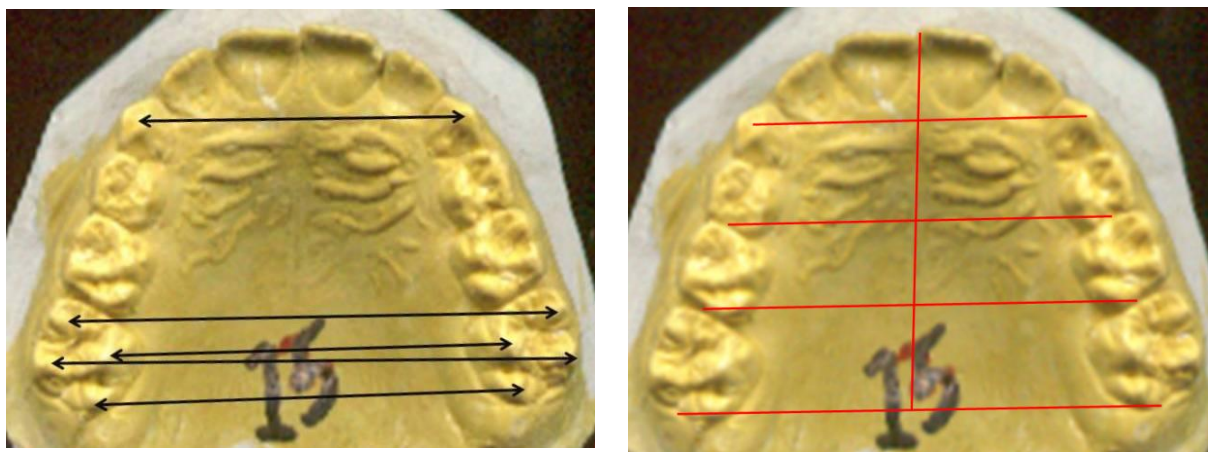|	No	Mean	Min	Max	Range	+SD
A	50	9.13	7.15	10.44	3.29	1.016
B	50	19.31	16.09	21.54	5.45	1.294
C	50	28.07	24.56	31.13	6.57	1.667
D	50	38.11	34.62	41.15	6.53	1.757

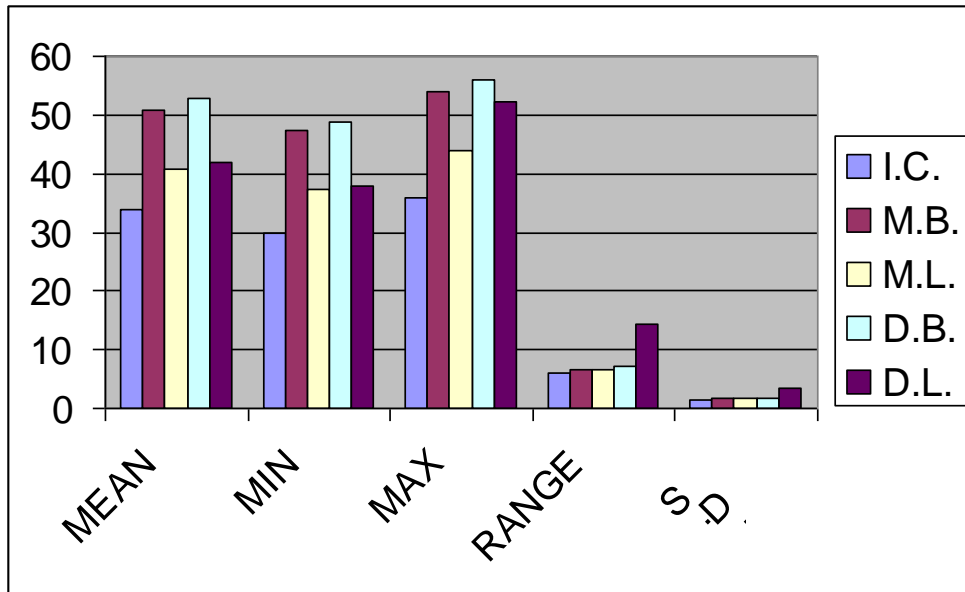Figure (1): Maxillary dental arch widths and lengths.

Figure (2) : Bar charts illustrate the descriptive statistics of the horizontal measurements.
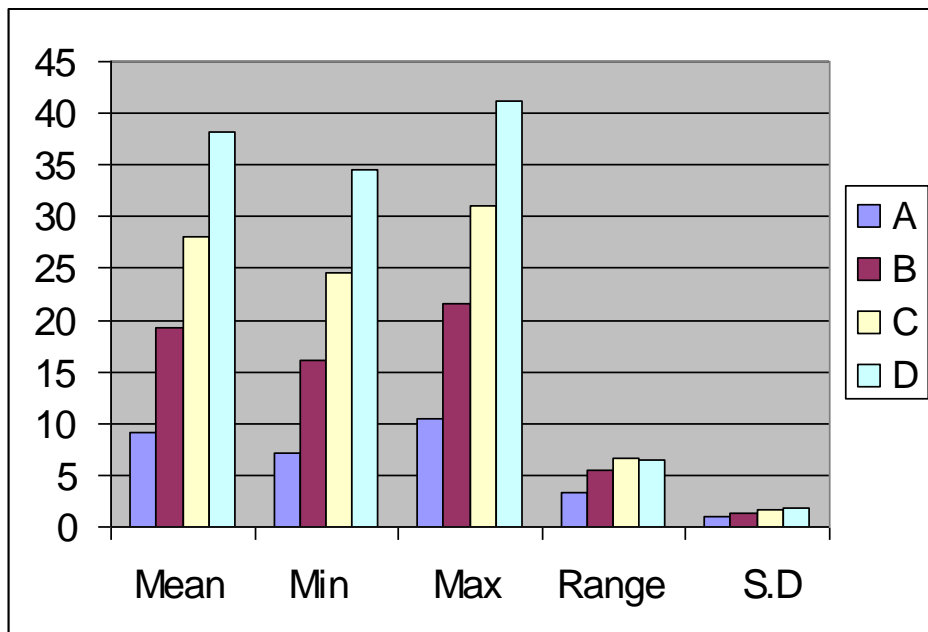

Figure (3) : Bar charts illustrate the descriptive statistics of the vertical measurements.