Mandibular dental arch dimensions in a sample of Iraqi children at the mixed dentition stage

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**ABSTRACT**

**Background:** The purpose of this study was to estimate the mandibular arch dimensions in a selected sample of Iraqi children from Baghdad city at the mixed dentition stage, aged 8 – 9 years.

**Materials and methods:** 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.

**Results:** The results show that the mean values of both arch lengths and widths for the children of the present study are of a lesser values than that estimated from previous Iraqi studies done on older age groups.

**Conclusion:** The findings of this study can be used as a basis for future Iraqi studies in other geographic areas in Iraq rather than the capital for the same age group.

**Key words:** Mandibular dimensions, mixed dentition, study models. \((J\text{ Bagh Coll Dentistry 2010;22(2):104-107})\)

**INTRODUCTION**

Information concerning 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\(^{(1)}\). Numerous studies have been made to study the dental arch dimensions at the permanent dentition stage \((2, 10)\) who measure both arches (maxillary & mandibular), and some measures the mandibular arch alone, using different materials from study models to photos and others, 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 \((11, 12)\). Few of them select the mixed dentition stage \((13, 14)\) and measure the width & length of both maxillary and 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. \((13-15)\).

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 and lateral incisors and the first permanent molars, the deciduous canines, first and second molars \((16, 17)\) 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 mandibular arch alone.

The aim of this study is to measure some of the mandibular 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 mandibular 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 (18). Figure 1 shows the Study Models Measurements which are:-

Mandibular 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 mandibular molars.
   ii-(ML): the distance between the mesiolingual cusp tips of right and left first permanent mandibular molars.
   iii-(DB): the distance between the distobuccal cusp tips of right and left first permanent mandibular molars.
   iv-(DL) : the distance between the distolingual cusp tips of right and left first permanent mandibular molars.

While the mandibular 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. (18)

RESULTS
All the variables of the mandibular 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 and figure 1 demonstrates the mandibular dental arch widths measurements, which shows that the mean values of the mandibular dental arch widths at IC were 27.17 mm and the MB, ML, DB and DL distances were 44.48 mm, 34.63 mm, 46.82 mm and 36.45 mm respectively. Table 1 show that the mesiobuccal distance has the widest range while mesiolingual distance has the narrowest range.

Table 2 and figure 2 demonstrates the measurements of the mandibular dental arch lengths which shows that the mean values of the mandibular dental arch lengths at A,B,C and D were found to be 4.81mm, 15.19 mm, 24.56 mm and 34.82 mm respectively.

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

DISCUSSION
The whole anteroposterior measurements of A, B, C and D of Iraqi 8-9 years male and female children in the present study show lesser values than that of the Indians (19) as shown in table 3, this finding can be attributed to the difference in the size of the teeth and to the shape of the arch, when we compare IC of Iraqi with other population like that of Turkish and American at the same age group we found that our IC distance is higher (20,21). In other words with short anteroposterior distance (A) and wide horizontal distance (IC) of our sample give a clue that the shape of the arch of our sample is more flatter anteriorly rather than tapered (21,22), because of the distance A and IC greatly determined the shape of the arch anteriorly.
When comparing the IM distance of our sample with other populations like American of the same age group and particularly for the MB distance, we found that the Iraqi MB distance possesses nearly the same values indicating that the posterior horizontal distance of the Iraqi’s are similar to that of the American, nevertheless further studies of the shape of the arch and the different ratios between the different horizontal and vertical distance is so essential in the future that can help us to estimate the shape of the whole arch which aid to a good pedodontics and orthodontic treatment (23).

Since the mandibular IC width has a stable distance or even decreased after the age of our sample (2, 21, 24), we can certify that the alignment of lower permanent anterior teeth and the shape of the arch which appears flatter in our sample than other populations provide us with an important clinical information when deciding to start an interceptive pedoorthodontic treatment (22-24).

When we look to intermolar distance (IM) we found that whenever the points goes distally whenever the horizontal distance increase i.e. the (DB) distance is higher than the (MB) distance and the (DL) distance is higher than the (ML) distance indicating a fact that the lower arch widen outside whenever we go distally or we can say the anteroposterior axis of the crown of the first permanent molar does not form a right angle with the horizontal line or plane and this is because of the most popular shape of the lower arch is V shape (16), and this is the normal anteroposterior position of the mandibular permanent molars.

Table 1: mandibular dental arch width in millimeters.

<table>
<thead>
<tr>
<th></th>
<th>No</th>
<th>Mean</th>
<th>Min</th>
<th>Max</th>
<th>range</th>
<th>+ SD</th>
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<tbody>
<tr>
<td>IC</td>
<td>50</td>
<td>27.17</td>
<td>24.90</td>
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<tr>
<td>MB</td>
<td>50</td>
<td>44.48</td>
<td>42.10</td>
<td>47.19</td>
<td>5.09</td>
<td>1.57</td>
</tr>
<tr>
<td>ML</td>
<td>50</td>
<td>34.63</td>
<td>31.87</td>
<td>39.72</td>
<td>7.85</td>
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<td>DB</td>
<td>50</td>
<td>46.82</td>
<td>44.12</td>
<td>50.16</td>
<td>6.04</td>
<td>1.78</td>
</tr>
<tr>
<td>DL</td>
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<td>36.45</td>
<td>33.48</td>
<td>39.44</td>
<td>5.96</td>
<td>1.74</td>
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</table>

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

Table 2: Mandibular Dental Arch Length in millimeters.

<table>
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<tr>
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<th>No</th>
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<th>Max</th>
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<th>+ SD</th>
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<td>4.81</td>
<td>3.80</td>
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<td>12.84</td>
<td>17.86</td>
<td>5.02</td>
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<td>50</td>
<td>24.56</td>
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<td>1.31</td>
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<tr>
<td>D</td>
<td>50</td>
<td>34.82</td>
<td>32.10</td>
<td>37.43</td>
<td>5.33</td>
<td>1.54</td>
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</table>

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

Table 3: Mandibular dental arch dimensions of different populations.

<table>
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<tr>
<th>distance</th>
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<th>Iraqi population</th>
<th>Turkish population</th>
<th>American population</th>
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<tbody>
<tr>
<td>A</td>
<td>6.78</td>
<td>4.81</td>
<td></td>
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<tr>
<td>B</td>
<td>16.97</td>
<td>15.19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>26.57</td>
<td>24.56</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>35.68</td>
<td>34.82</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IC</td>
<td>27.17</td>
<td>26.27</td>
<td>25.5(M)*</td>
<td>24.4(F)*</td>
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<tr>
<td>IM</td>
<td>44.48</td>
<td>39.02</td>
<td>44.6(M)*</td>
<td>42.1(F)*</td>
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* (M: male, F: female).

**All measurements are in millimeters.
REFERENCES