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Determining Tooth Size Ratio in an Iranian-Azari Population

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Abstract

Aim: The aim of this investigation was to determine the tooth size ratio in an Iranian-Azari population.

Method and Materials: The Bolton tooth size analysis was performed on a sample of 50 plaster models (25 male subjects, 25 female subjects) of Iranian-Azari subjects. The mesiodistal widths of all teeth were obtained and the Bolton anterior ratio and overall ratio were calculated. The mean, range, and standard deviation were calculated for the anterior and overall ratio, and a coefficient of variation was obtained for the tooth size ratio.

Results: For the anterior ratio (3-3), the Iranian-Azari had a mean of 78.0 mm with a standard deviation of 3.1; the range was 73.68 to 84.6 mm. For the overall ratio (6-6), the mean was 92.0 mm with a standard deviation of 2.4; the range was 88.09 to 97.5 mm.

Conclusions: The results from the Iranian-Azari subjects in the study are similar to Bolton's original data for an American population. These values and the degree of variation were similar to the original data by Bolton, indicating the Bolton analysis for Caucasian samples can be transferred to an Iranian-Azari population. It also confirms no relevant sexual dimorphism exists, and these values are valid for both male and female subjects.

Keywords: Tooth size ratio, Bolton analysis, Iranian-Azari

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Introduction

The proportional relationship between the sizes of upper and lower teeth was accepted as an important index by which an orthodontist can determine the possible functional and esthetic limits of treatment, especially with regard to the finishing phase.[1,2] Many studies have revealed the importance of the harmonious relationship between the teeth sizes in the same arch and between arches.[3-9]

Bolton's ratios apply only to white women and should not be applied indiscriminately to white men, blacks, and others.[10-16] The generalized use of the Bolton analysis and the proposed values for a harmonious dentition are under question and might not be valid for other populations. However, other investigations differentiated this analysis by sex.[4,11,17-19] Therefore, different sexes and different ethnic groups may have a different Bolton ratio.[20]

The aims of the present study were as follows:

1. Determine the Bolton ratios for an Iranian-Azari population.
2. Determine the sexual differences between Iranian-Azari males and females.
3. Compare the ethnic difference between an Iranian-Azari population and Caucasians.

Method and Materials

Plaster models of 50 people (25 male subjects, 25 female subjects, ages 20-28 years) were randomly chosen from dental students in the Orthodontic Department of the School of Dentistry at the Tabriz Medical Sciences University, according to the following inclusion criteria:

- The subject had to be Azari with Azari parents (living in Western Iran).
- The subject had an Angle Class I canine and molar relationship.
- All teeth were present and fully erupted from first molar to first molar.
- There was the presence of arch symmetry.
- There was an absence of interproximal caries, restorations, or other conditions that would result in the reduction of mesiodistal tooth width.
- The subject had no previous orthodontic treatment.
- The subject had a normal overjet and overbite (gross dental abnormalities were rejected).

A digital Boley gauge with a Vernier scale that provided a precision reading to the nearest 0.01 mm was used to measure the teeth. The sharp tips of the calipers facilitated accuracy of measurement. The mesiodistal width was obtained by measuring the maximum distance between the mesial and distal contact points of the teeth on a line parallel to the occlusal plane. Two investigators measured each arch from the right first molar to left first molar. The mean values of these two measurements were used in further calculations.

The anterior ratio and overall ratio were calculated according to Bolton for the statistical data analysis. The individual data were summarized as ranges and mean values of these ratios. The data were checked for normal distribution. Variations were analyzed as coefficients of variation, standard deviations, and standard errors of the mean values. These data were compared with results from a Bolton study.[1]

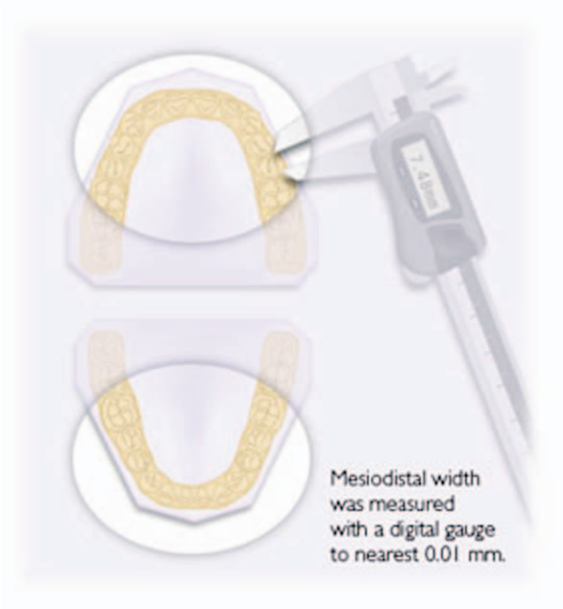

Table 1. Tooth size ratio for the Iranian-Azari population.

	Range		Mean	SD	P	CV
Anterior Ratio	73.68	84.6	78.0	3.1	0.44(NS)	0.41
Overall Ratio	88.09	97.5	92.0	2.4	0.34(NS)	0.71
CV: Coefficients of variation						

Table 2. Sex specific tooth size ratio in the Iranian-Azari population.

	Range				Mean		
	Male		Female		Male	Female	P
Anterior Ratio	73.1	83.82	75.2	84.2	77.0	78.0	0.74(NS)
Overall Ratio	87.09	97.05	88.09	98.66	92.0	92.0	0.82(NS)

Table 3. Comparison of tooth size ratio in the Irannian-Azari to Bolton original data.

Ratio	Range				Mean		SD		
	Iranian-Azari		Caucasian		Iranian-Azari	Caucasian	Iranian-Azari	Caucasian	P
Anterior	73.68	84.6	74.5	80.4	78.0	77.2	3.1	1.65	0.43(NS)
Overall	88.09	97.05	87.5	94.8	92.0	91.3	2.4	1.91	0.11(NS)

Results

Table 1 summarizes the mean values, standard deviations, ranges, coefficients of variations, and standard errors of the anterior and overall tooth size ratios in an Iranian Azari population.

For the anterior ratio (3-3), the Iranian-Azari sample had a mean of 78.0 mm with a standard deviation of 3.1; the range was 73.68 to 84.6 mm. For the overall ratio (6-6), the mean was 92.0 mm with a standard deviation of 2.4; the range was 88.09 to 97.5 mm.

The mean values for the anterior and overall ratios for male and female subjects were very similar and did not differ significantly (Table 2).

The comparison with the original data from Bolton indicated higher ranges for anterior and overall ratios with mean values being very similar. The degree of standard deviation was higher in the Iranian-Azari sample (Table 3).

Discussion

The high range of values in the Iranian-Azari sample demonstrates variability. In spite of the fact selected subjects had a Class I canine and molar relationship with good occlusion, this variation might be attributed to compensation of tooth size ratio by inclination of the teeth to create a harmonious occlusion or it was simply indicative of the type of population that constituted the sample.

The sex specification analysis also demonstrated no relevant differences between male and female subjects which confirms the findings of Smith, Arya, and Garn.[17-19]

The findings from the Iranian-Azari subjects are similar to Bolton's original data from an American population. The mean overall and anterior ratio of Iranian–Azari and Bolton's sample were similar, indicating the generalized application of the Bolton analysis for Caucasian samples to the Iranian-Azari population.

Conclusion

This study established the anterior tooth size ratio and overall ratio in an Iranian-Azari population. The findings confirm no relevant sexual dimorphism exists with these values being valid for both male and female subjects.

The Iranian-Azari anterior tooth size and overall ratios were similar to the original data of an American population.

In summary this study indicates the analysis and ideal values for a harmonious dentition developed by Bolton can also be used on an Iranian-Azari population.

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