Original Article

DOI: 10.17354/ijss/2015/388

Evaluation of Relation between Bizygomatic Width and Mesiodistal Dimension of Maxillary Central Incisor in Indian Population: An *In Vivo* Study

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Abstract

Introduction: One of the primary concern in-denture esthetics is the selection of the anterior teeth, correct proportion is essential for harmony and facial rhythm. Loss of teeth not only affects facial appearance but also creates psychological trauma to person, hence it is essential that an esthetically pleasing and functionally comfortable replacement of the missing should be provided. There are various methods available for selection of teeth, i.e. golden proportion bizygomatic width, intercommissural width, interalar width and intrepupillary. However, no universally accepted parameter currently exist for the selection of anterior teeth in Indian population.

Purpose: The purpose of my study is to evaluate the relation between bizygomatic width and dimension of a maxillary central incisor in Indian population.

Materials and

Methods: A sample size of 200 subjects (100 males and 100 females) were selected according to criteria. Facial measurement is done with the help of face bow and dental measurement done with the help of veneer caliper.

Results: According to present study dental measurement in male and female showing highest percentage co-incidence with pound's formulae with a less standard error of measurement. Comparison of the bizygomatic width of male and female showed male have a larger width than female. Comparison between the mesiodistal dimension of central incisor between male and female and it is found that male have a larger dimension than female with a mean of 8.51 mm. Correlation between facial and dental measurement using Pearson's correlation coefficient showed the relation between the measured value of central incisor by pound's formulae and by digital veneer caliper.

Conclusion: According to the current study, it is concluded that the correlation between Pound's formula and the measured value is positive. There was only limited research in the literature on bizygomatic width as a guide for selection of anterior teeth, so future research should focus on this measurement.

Key words: Denture esthetic, Facial rhythm, Golden proportion, Pound's formulae

INTRODUCTION

One of the primary concerns in the aesthetic forefront of dentures is the selection of the anterior teeth; a correct proportion is essential for harmony and facial rhythm. Loss of teeth affects an individual's facial appearance besides creating psychological trauma to the person. Hence, it is essential that an aesthetically pleasing and functionally comfortable replacement of the missing teeth be provided. According to Young, it is apparent that beauty, harmony, naturalness, and individuality are major qualities of aesthetics.[1]

In order to attain a pleasing aesthetic appearance, the maxillary anterior teeth must be in proportion to facial morphology.[2-4] Several anatomic measurements such as

Access this article online

www.ijss-sn.com

Month of Submission : 07-2015
Month of Peer Review : 08-2015
Month of Acceptance : 08-2015
Month of Publishing : 09-2015

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the intercommissural width, bizygomatic width, inter-alar width, and interpupillary distance have been proposed to aid in determining the correct size of the anterior teeth. The calculation of the dimension of the maxillary anterior teeth for an edentulous patient in the absence of pre-extraction records is a rather onerous task. There are various methods available for selection of teeth, i.e. golden proportion (1.618:1),[4-6] bizygomatic width, intercommissural width, interalar width and interpupillary.[7-11]

Early work on tooth size used to be based on complete denture fabrication and had a negligible scientific foundation. Examples of such work include the "temperamental theory"[12] where the practitioner determines the tooth form based on the patients' health and appearance. This hypothesis had been in use in the late 19th century and was replaced by a system using the facial form to determine the tooth form, although this was later discredited. Frush and Fisher[13] introduced the dentogenic theory in the late 1950s using the "sex, personality, age (SPA) factor" in selecting denture teeth. Dentogenics uses subtle changes in tooth arrangements to reflect the SPA factors, such as mimicking ageing by increasing abrasion and spacing. This theory still has some advocates. Conflicting evidence exists in the literature on tooth size. The size of the central incisors as a proportion of skull measurements has been used, including length (1⁄20 skull length) and width (1⁄16 bizygomatic width).

However, no universally accepted parameter currently exists for the selection of anterior teeth in the Indian population.

Hence, the purpose of this study is to evaluate the authenticity of the relation of bizygomatic width with maxillary central incisor in the Indian population.

MATERIALS AND METHODS

A sample population of 200 subjects (100 males and 100 females) was selected from Datta Meghe Institute Medical Science, Sawangi (Meghe), Wardha, Maharashtra, according to the inclusion criteria.

Inclusion Criteria

1. They should be Indian
2. They should have all permanent maxillary anterior and premolar teeth
3. They should have no history of orthodontic treatment
4. They should not have more than one full or one three fourth crown in maxillary anterior and premolar teeth
5. They should not have proximal restorations that grossly affected the width of maxillary anterior teeth
6. They should be above 18 years of age, so facial growth was complete
7. The corner of the mouth should be situated superiorly to the occlusal horizontal plane
8. There should be no interdental spacing or crowding.

Data Collection

Each subject was seated in a dental chair with the head upright supported by the headrest, so as to enable them to face forward on the horizon, with the occlusal plane of the maxillary teeth parallel to the floor.

Facial Measurement

Bizygomatic width is measured between two most prominent point on the zygomatic bone with the help of face bow (Figure 1).

Dental Measurement

Mesiodistal dimension of maxillary central incisor is measured between interproximal contact points with the help of a vernier caliper (Figure 2).

Figure 1: Measurement of bizygomatic width between two most prominent point on zygoma

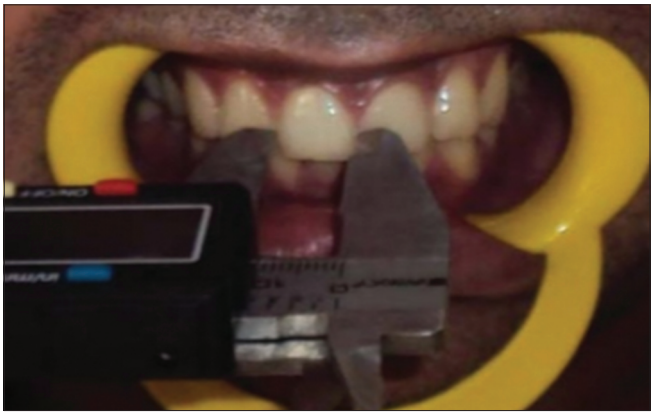
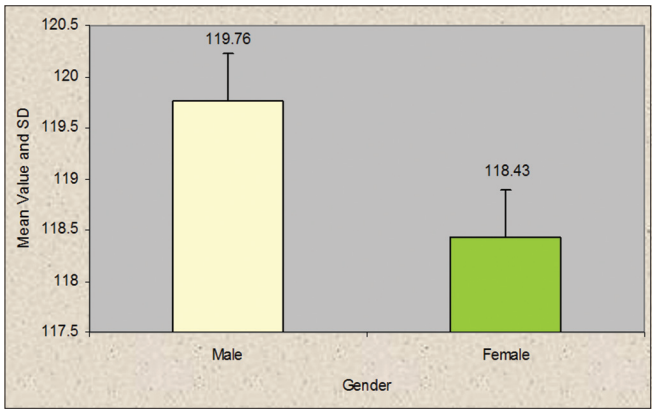


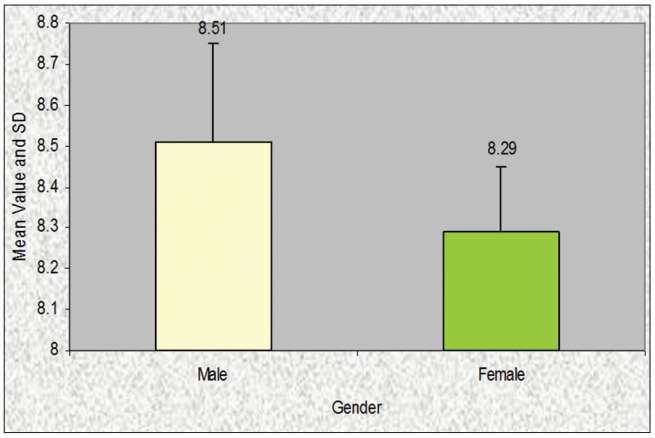
Figure 2: Measurement of width of central incisor by digital veneer caliper

RESULTS

According to the present study, dental measurements in males and females show the highest percentage co-incidence with Pound's formulae (Table 1), with a less standard error of measurement. In Table 2 and a comparison of bizygomatic widths of males and females is depicted, thus showing the male having larger widths (mean = 119.76 mm) as compared to females (mean = 118.43 mm). Graph 1 depicts the bar diagram of the same. Table 3 and a portrays a comparison between the mesiodistal dimensions of central incisors between males and females, again showing that males have larger dimensions than females, with a mean of 8.51 mm (Graph 2). Table 4 shows a correlation between facial and dental measurements using Pearson's correlation coefficient (Graph 3a and 3b). Table 1 the portrays a comparison between the values of the central incisors, measured using the pound's formula and the digital veneer caliper (Graph 4).



Graph 1: Comparison of facial measurement in male and female



Graph 2: Comparison of dental measurement in male and female

Table 1: Actual between dental measurement and pound's formulae

Gender	Mean	SD	*N*	% difference	SE	*P*
Male						
Dental measurement	8.50	0.23	100	13.17	0.02	0.0004 S, *P*<0.05
Pound's formulae	7.38	0.02	100			
Female						
Dental measurement	8.29	0.16	100	10.85	0.01	0.0005 S, *P*<0.05
Pound's formulae	7.39	0.03	100			

SD: Standard deviation, SEM: Standard error

Table 2: Comparison of facial measurement in male and female descriptive statistics

Gender	*N*	Mean	SD	SEM
Male	100	119.76	0.47	0.04
Female	100	118.43	0.46	0.04

SD: Standard deviation, SEM: Standard error of mean

Table 2a: Student's *t*-test

T	df	*P*-value	Mean difference	SE difference	95% CI of the difference	
					Lower	Upper
20.11	198	0.000 S, *P*<0.05	1.33	0.06	1.20	1.46

CI: Confidence interval, SE: Standard error

Table 3: Comparison of dental measurement in male and female descriptive statistics

Gender	*N*	Mean	SD	SEM
Male	100	8.51	0.24	0.02
Female	100	8.29	0.16	0.01

SD: Standard deviation, SEM: Standard error of mean

Table 3a: Student's *t*-test

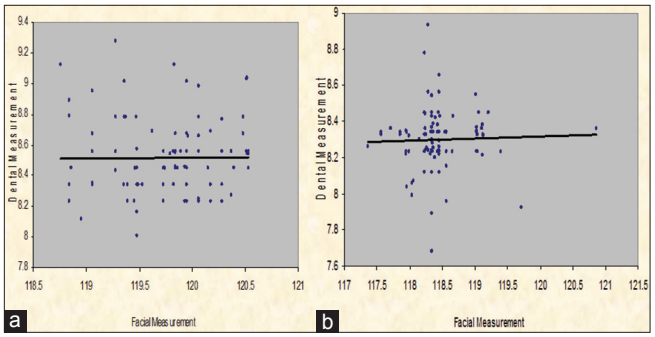
T	df	*P*-value	Mean difference	SE difference	95% CI of the difference	
					Lower	Upper
7.36	198	0.000 S, *P*<0.05	0.21	0.02	0.15	0.27

CI: Confidence interval

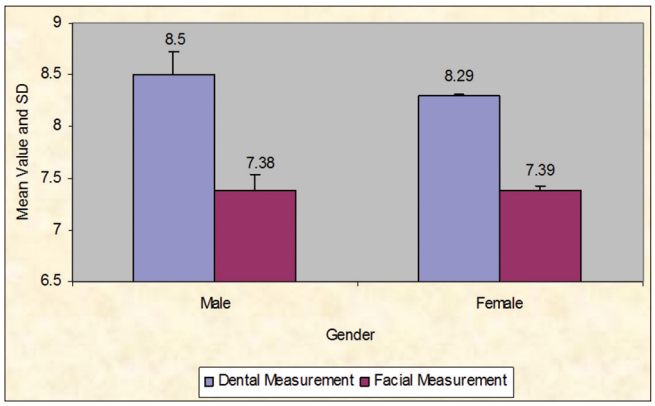
Table 4: Correlation coefficient between facial and dental measurement Pearson's correlation coefficient

Gender	Mean	SD	*N*	Correlation "*r*"	*P* value
Male					
Facial measurement	119.76	0.47	100	0.007	0.94 NS, *P*>0.05
Dental measurement	8.51	0.24	100		
Female					
Facial measurement	118.43	0.46	100	0.03	0.719 NS, *P*>0.05
Dental measurement	8.29	0.16	100		

SD: Standard deviation, NS: Non-significant



Graph 3: (a) Correlation coefficient between facial and dental measurement: male, (b) Correlation coefficient between facial and dental measurement: female



Graph 4: Actual between dental measurement and Pound's formulae

DISCUSSION

In general, every population is genetically diverse due to geographical location and historical background, giving rise to many dental and facial variations. Therefore, information regarding tooth norms groups may prove useful to clinicians when restoring anterior teeth. The size and morphology of the maxillary anterior teeth have been studied in the past to enable the charting of racial norms and gender characteristics. In earlier studies, measurements were made using extracted teeth. However, recent investigations attempted to measure the clinical tooth dimensions either on casts or using computer-based images or intraoral evaluations in most of these studies, the width of the maxillary central incisor was used to assess racial and gender differences.

Gender variations in the dimensions of the anterior teeth have been noted for most racial groups, with men exhibiting wider anterior teeth than women. Gillen *et al.*[14] reported that the maxillary anterior teeth of men were wider and longer than those of women in both white and black populations. Similarly, Sterrett *et al.*[15] reported the mean width and length of the clinical crowns of the maxillary anterior teeth of men to be significantly greater than the corresponding dimensions in women in a white population. Owens *et al.*[16] measured the width of the maxillary central incisor in several racial groups and noted variations in most of them, with men again having wider central incisors than women. In the present study, the mean width values for the central incisors ($P = 0.05$) for men were significantly greater than the corresponding dimensions for women; these findings are in agreement with the results of related studies.

The relationship between the width of a central incisor and the bizygomatic width (1:16) is commonly used to determine the size of the maxillary anterior teeth. Cesario and Latta found that a ratio of 6.6, which had previously been proposed, existed between the interpupillary distance and the central incisor width in white men and women, and also in black women. Recently, in a study by Latta *et al.*,[10] the relationships among the width of the mouth, the interalar width, the bizygomatic width, and the interpupillary distance were evaluated. It was concluded that these relationships might be used as references if applied in combination, although racial and gender differences were detected when anatomic measurements were evaluated individually. Forrest *et al.* reported that there is a correlation between bizygomatic width and maxillary central incisor, but it is not of sufficient magnitude to justify the use. Hasanreisoglu *et al.*[17] stated that the relationship between bizygomatic width and width of central incisor occurred mostly in females. Boucher stated that tooth selection made by this procedure must be considered as being very tentative.

The present study also shows a correlation between pound's formulae and bizygomatic width.

CONCLUSION

Within the limitations of the present study, the following conclusions have been drawn:

Comparison of all the mean values between males and females reveal.

- Mean bizygomatic width and width of central incisor were greater in males. According to the current study, it is concluded that the correlation between Pound's formula and the measured value is positive
- There was only limited research in the literature on bizygomatic width as a guide for selection of anterior teeth, so future research should focus on this measurement
- Furthermore, new methods should be found to standardize the measurement of the bizygomatic width.

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How to cite this article: Rawat A, Godbole SR, Sathe S, Patidar N, Ramteke S. Evaluation of Relation between Bizygomatic Width and Mesiodistal Dimension of Maxillary Central Incisor in Indian Population: An *In Vivo* Study. Int J Sci Stud 2015;3(6):38-42.

Source of Support: Nil, **Conflict of Interest:** None declared.