EVALUATION OF RELATIONSHIP BETWEEN BIZYGOMATIC WIDTHS, INTER PUPILLARY DISTANCE AND DISTANCE BETWEEN INNER AND OUTER CANTHUS OF BOTH THE EYES WITH TOTAL WIDTH OF MAXILLARY ANTERIOR TEETH IN SALEM POPULATION: A COMPARATIVE STUDY

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Abstract

Introduction: Replacing missing teeth, selection plays a very important role in the outcome of the treatment as well as the patient satisfaction associated with that treatment. The objectives of the study were to evaluate whether there is a correlation between the relationship between bizygomatic width, interpupillary distance and distance between the inner and outer canthus of both the eyes with the total width of maxillary anterior teeth in this population.

Material and Methodology: There were 99 Participants who were chosen in the study of which 50 were Male and 49 were Female. Correlation between bizygomatic width, interpupillary distance and distance between the inner and outer canthus of both the eyes with the total width of maxillary anterior teeth was done using Pearsons Correlation.

Mean bizygomatic width, interpupillary distance and distance between the inner and outer canthus of both the eyes with the total width of maxillary anterior teeth was obtained and ANOVA was applied between Arch Form and Mean bizygomatic width, interpupillary distance and distance between the inner and outer canthus of both the eyes with the total width of maxillary anterior teeth.

All the stats were done using IBM SPSS Version 21. ($P<0.05$) was considered to statistically significant.

Results: There is a significant correlation between total width of maxillary anterior teeth with intercanthal distance ($p <0.001$) and interpupillary distance ($p = 0.03$). For all 99 participants the mean (SD) R. intercanthal distance was 1.54 (0.11) mm. The mean (SD) R. bizygomatic width was 2.49 (0.21) mm and it was found to be statistically different among the three arches ($p=0.02$). With the post hoc test, there was a statistical difference found between square and tapered arch form for bizygomatic width ($p=0.006$). The mean (SD) interpupillary distance was 1.31 (0.09) mm and it was found to be statistically different among the three arches ($p=0.03$). Post hoc test showed a statistically significant difference between square and tapered arch form for interpupillary distance ($p=0.011$).

Conclusion: The null hypothesis was also rejected in this case because all the variables help choose anterior teeth as they have a high to moderate association with the maxillary anterior teeth.

Keywords:- Bizygomatic width, inter pupillary distance inner and outer canthus of eye, Correlation.

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Introduction

Medical science and healthcare advancements have contributed significantly to increasing the average life span in India. In dental practises, the number of patients reporting the need for prosthodontic rehabilitation has significantly increased. Increased lifespan and general dental awareness have boosted overall economic growth, which will increase the number of prosthodontic rehabilitations in the coming years.[1]

Whenever we come across replacing missing teeth, selection plays a very important role in the outcome of the treatment as well as the patient satisfaction associated with that treatment. [2]

A person's aesthetic attractiveness and psychological well-being are both impacted by tooth loss. Hence, it is crucial to offer a substitute for the lost teeth that is both visually beautiful and practically pleasant. Young asserts that the key components of aesthetics are beauty, harmony, naturalness, and originality.[3]

Most patients usually demand replacement that would camouflage with the remaining dentition of their facial forms and features. Its ability to defy detection is paramount for a successful anterior teeth replacement. For this, the step of artificial teeth selection is very critical. Failure in this step will lead to a prosthesis which will not be accepted/appreciated by the patient, however, comfortable it may be.[1]

The maxillary anterior teeth must be proportionate to face architecture in order to accomplish a favourable aesthetic appearance.[4-6]

Pre-extraction data are helpful for selecting teeth, and information from the patient's natural dentition is a dependable resource for creating a successful and aesthetically pleasing restoration for a patient. The choice of anterior teeth is improved by the lack of natural teeth, pre-extraction data, Casts, pictures, and radiographs.[1]

Many artificial tooth manufacturing companies have provided dental surgeons with moulds, guidelines, shade guides, folders, and brochures that help them in the process of choosing the anterior teeth in order to make the anterior teeth selection method expedient. [1]

There is sufficient literature available to support the various anatomical measurements that have been proposed which aid in the successful selection of maxillary anterior teeth such as bizygomatic width, interpupillary distances, intercommissural width, head diameter, inner canthal distance, interalar distance.[7] To locate or measure the entire dimension of the maxillary anterior teeth, it is always preferable to use multiple anatomical landmarks. When the aforementioned anatomical landmarks are absent due to conditions like pan-facial trauma or other causes that make the facial features asymmetrical, this difference in anatomical landmarks will also be helpful.

Many criteria may be employed effectively as a tool for anterior tooth restoration, depending on the patient's expectations and the dentist's level of experience. Some often utilised criteria relating the aesthetic qualities of dental shapes include gender traits and the association between tooth, arch, and facial forms.[7-11]

As per the literature, most of the studies pertaining to anterior teeth size, shape, and form were conducted based on the Caucasian population.[12] Moreover, very recently various studies have been also conducted involving various regions across the globe. There are many studies also stating that there is a significant difference between various facial parameters in different races and ethnic groups. Therefore, it would not be justifiable to say that the norms and features of one population may be used for another.

The information regarding the various anatomical factors that can be used to select maxillary anterior teeth for a Salem population is not presently available. Therefore, to provide more clarity, the role of the distance between the inner and outer canthus of both the eyes, bizygomatic width, and interpupillary distances was studied as an aid in maxillary anterior teeth selection in Salem, Tamil Nadu population.

The objectives of the study were to evaluate whether there is a correlation between the relationship between bizygomatic width, interpupillary distance and distance between the inner and outer canthus of both the eyes with the total width of maxillary anterior teeth the distance between the inner and outer canthus of both the eyes and maxillary anterior teeth in this population. The null hypothesis is that the distance between the inner and outer canthus of both eyes, bizygomatic width, interpupillary distance has no correlation with the width of maxillary anterior teeth.

Materials and methods

The study was conducted in the outpatient department of Vinayaka missions shankarachariyar dental college Salem in the Department of Prosthodontics, crown and bridgework & oral implantology. A total of 99 subjects participated in

the study out of which 50 were males and the rest 49 were female, from areas in and around Salem. All the participants of the study ranged between the age group of 18-25 years.

The subject selection criteria for the study were, (1) Participants with no proximal restorations on the mesial and distal surfaces of six maxillary anterior teeth, which affects its mesiodistal dimension, (2) Intact contact points between six maxillary anterior teeth which are fully erupted, Absence of crowding of maxillary anterior teeth, (3) Participants who are free from any congenital or acquired facial abnormality, (4) Participants with Salem ancestors from both father and mother side from at least two previous generations.

The exclusion criteria for the study were, (1) Participants who have undergone restorations or size alterations of maxillary anterior teeth, (2) Participants with spacing of maxillary anterior teeth, (3) Participants with gingival hyperplasia or gingival recession of maxillary anterior teeth, (4) Participants who have undergone orthodontic treatment,(5) Participants who have undergone prosthodontic treatment such as crowns or fixed partial dentures, (6) Participants who have undergone plastic facial surgery.

Sample Size Calculation

Statistical Methodology

The data was obtained and entered in Microsoft Excel version 13. The data was subjected to Statistical Analysis using IBM SPSS version 21. The Mean and SD of the parameters was obtained and the correlation analysis between the parameters was done using Pearsons Correlation. ANOVA was applied between Groups and all the statistical tests were conducted keeping Confidence Interval at 95% and ($p<0.05$) was considered to be statistically significant.

Determination of various Anthropometric measurements

BIZYGOMATIC WIDTH:

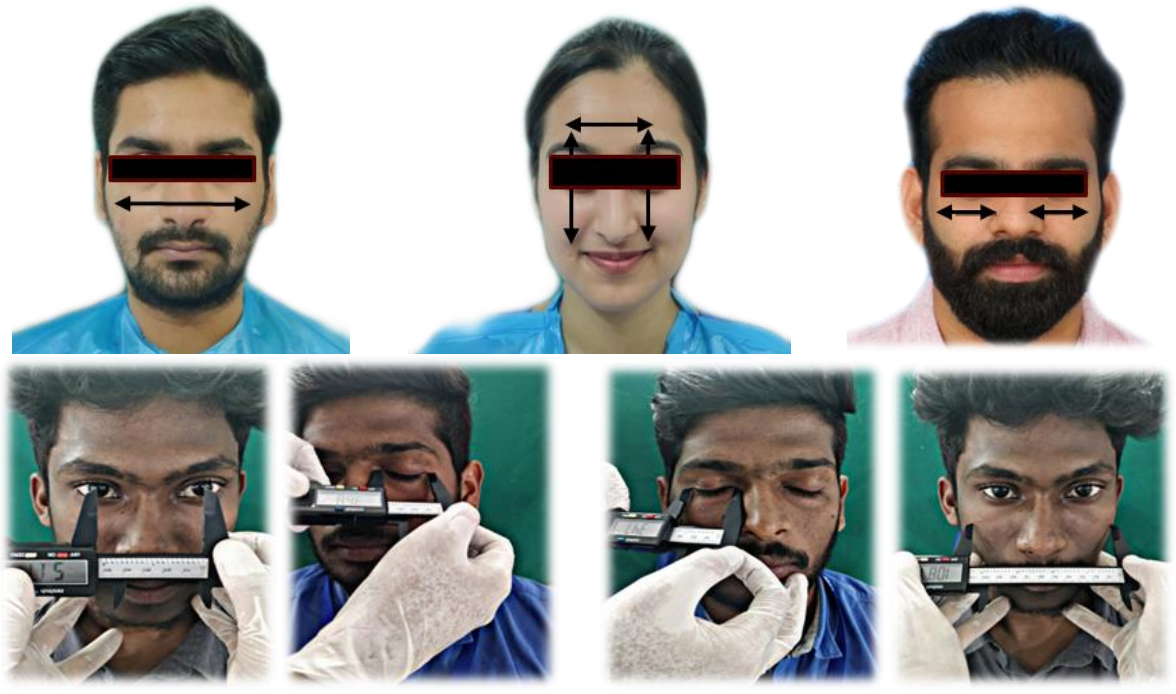
The measurement of bizygomatic width was done using a digital vernier calliper. The most prominent points on the zygomatic bone were marked and the distance between both zygomatic prominences was measured and noted down for all the patients.

INTERPUPILLARY DISTANCE:

The interpupillary distance for each patient was measured by asking the patient to look straight with his/her head upright. The distance between both the pupils of the eye was measured with a digital vernier calliper.

DISTANCE BETWEEN THE INNER AND OUTER CANTHUS OF BOTH THE EYES:

The distance between the inner and outer canthus of both the right and left eyes was measured individually and summed up and was considered as the total distance between the inner and outer canthus of both eyes.



IMPRESSION MAKING:

The Maxillary impressions of participants were made using alginate (Tropicalgin Zhermack, Italy) with an ideal water-powder ratio. The resultant casts were poured immediately (Type III dental stone Kalabhai, India). The mesiodistal width of six maxillary anterior teeth as in a dental arch was measured on the cast using a Digital Vernier Calliper. (write the brand name) The distance between the distal surfaces of maxillary canines from the region of proximal contacts was measured. To rule out inter-examiner variability, the same examiner made all the impressions and measurements. The measurements were made three times, and the mean was calculated.

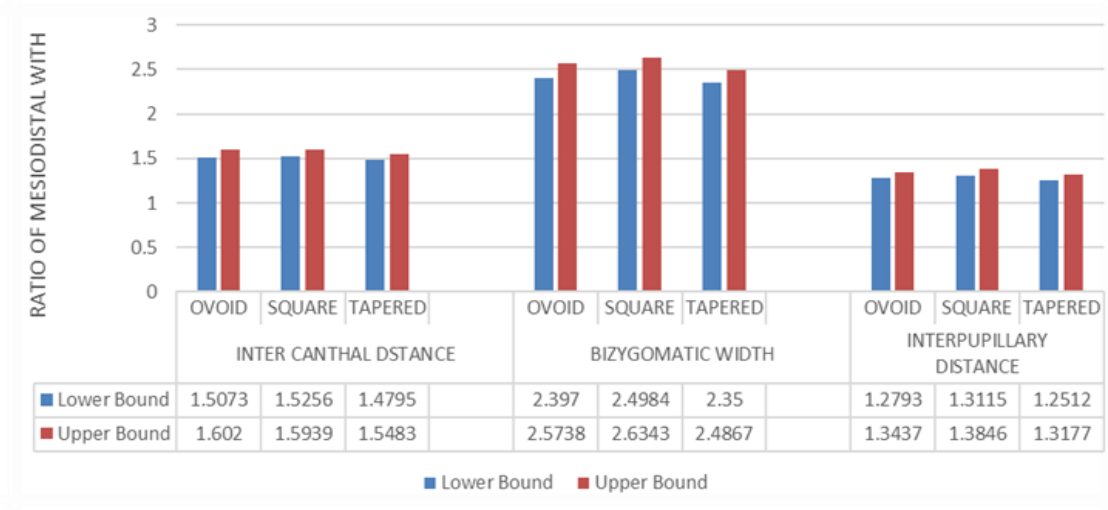
RESULTS:

Table 1. Correlation of total width of maxillary anterior teeth with intercanthal distance, bizygomatic width and interpupillary distance

		Intercanthal Distance	**Bizygomatic Width**	**Interpupillary**
Total of MD Width	Pearson Correlation	0.482	-0.027	0.219
	P	< 0.001**	0.787	0.030*
Intercanthal Distance	Pearson Correlation	**1.000**	0.210	0.139
	P	.	0.037*	0.169
Bizygomatic Width	Pearson Correlation		**1.000**	0.562
	P		.	< 0.001**

* Significant at 5 %; ** Significant at 1 % (Highly significant)

*There is a significant correlation between total width of maxillary anterior teeth with intercanthal distance (p <0.001) and interpupillary distance (p = 0.03). R: correlation coefficient, SD: Standard deviation



The above given diagram shows the upper bound and lower bound values for each anatomical landmark (Intercanthal, Bizygomatic & Interpupillary) for all the three types of arch type (Square, Tapered & Ovoid).

The total measurement of the chosen anatomical landmark can be divided by either with upper or lower bound values or both, which will give the predictable range between which the total Mesio - distal width of the six maxillary anterior teeth.

Table 2. Comparison of the mean of R. Intercanthal distanc, R. Bizygomatic width and R. Interpupillary distance among the three arch forms studied

	Arch Form	Mean	SD	ANOVA	P Value*
R. Inter Canthal Distance	Ovoid	1.55	0.13	1.711	0.186
	Square	1.56	0.09		
	Tapered	1.51	0.09		
	Overall	1.54	0.11		
R. Bizygomatic Width	Ovoid	2.48	0.24	3.994	0.022
	Square	2.56	0.19		
	Tapered	2.41	0.19		
	Overall	2.49	0.21		
R. Interpupillary	Ovoid	1.31	0.09	3.647	0.03
	Square	1.34	0.10		
	Tapered	1.28	0.09		
	Overall	1.31	0.09		

*ANOVA test was used, SD: Standard deviation.

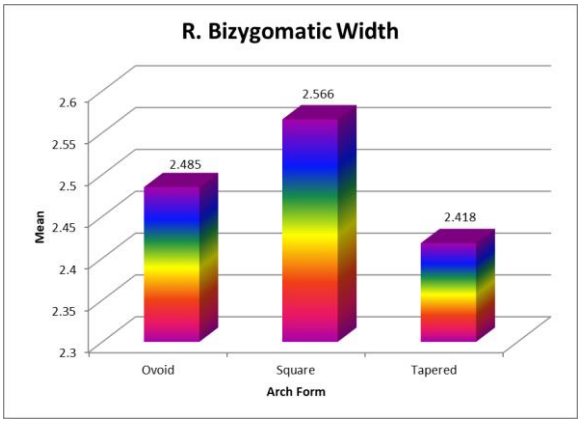
The study was conducted in the outpatient department of Vinayaka mission shankarachariyar dental college Salem in the Department of Prosthodontics, crown and bridgework & oral implantology. All 99 participants from areas in and around Salem were enrolled in the study of which 50 were males and 49 were females. All the participants of the study ranged between the age group of 18-25 years. The mean (SD) age of the participants was 22.62 (1.98) years.

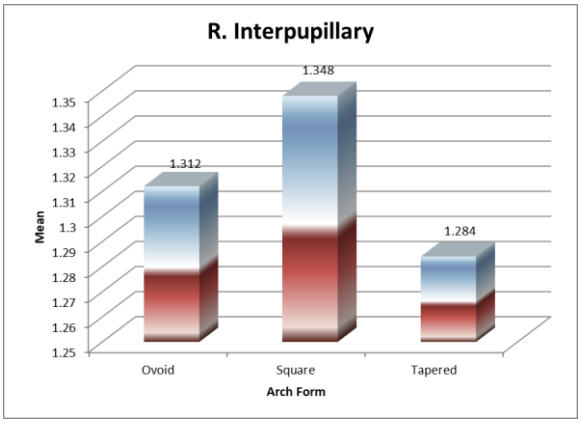
Table 1 depicts the correlation of total width of maxillary anterior teeth with intercanthal distance, bizygomatic width and interpupillary distance. The mean (SD) of width of maxillary anterior teeth was 44.82 (2.82) mm. The correlation of the total width of maxillary anterior teeth with intercanthal distance was found to be highly significant (r = 0.482; p <0.001). The interpupillary distance was also found to be significantly correlated with the total width of maxillary anterior teeth (r = 0.219; p=0.03).

We found a significant correlation of bizygomatic width and interpupillary distance (r= 0.562, p<0.001) and with intercanthal distance (r=0.210, p= 0.03).

Table 2 describes the mean values and standard deviation of intercanthal distance, bizygomatic width and interpupillary distance among the various arch forms, ovoid, tapered and square. For all 99 participants the mean (SD) R. intercanthal distance was 1.54 (0.11) mm. The mean (SD) R. bizygomatic width was 2.49 (0.21) mm and it was found to be statistically different among the three arches (p=0.02).

With the post hoc test, there was a statistical difference found between square and tapered arch form for bizygomatic width (p=0.006). The mean (SD) interpupillary distance was 1.31 (0.09) mm and it was found to be statistically different among the three arches (p=0.03). Post hoc test showed a statistically significant difference between square and tapered arch form for interpupillary distance (p=0.011).





DISCUSSION

It is well known that different races and ethnic backgrounds have different face traits. In the absence of pre-extraction information, many anthropometric cues have been suggested to supplement the sampling of anterior teeth. [13]

Racial, cultural, and gender disparities in tooth size were previously only measured using extracted teeth. Clinicians often utilised casts to quantify tooth dimensions for intraoral estimations in studies.[14-17] According to several findings, gender identity depends on the MD and MCI.[18]

The present study was conducted in the Salem City. The study included tried to include equal number of study participants but 99 subjects participated in the study out of which 50 were males and the rest 49 were female, from areas in and around Salem. All the participants of the study ranged between the age group of 18-25 years.

To compare its measures with the prior aesthetic standards and outcomes, the ratio of the MD of MCI to BZW was computed. BZW, which is regarded as the broadest point on the face and remains consistent throughout life, aids in determining the width of a person's facial skeleton in the event that a dental or dental arch aberration arises.

In our study we found that R. Bizygomatic Width and R. Interpupillary was statistically significant between various forms of the arch. While the difference of mean for the R. Inter Canthal Distance was not statistically significant for different arch form.

In a 1967 investigation to examine the connection between both the size of the skull and teeth, Kern BE challenged this. His research revealed that 42 (8%) had a ratio of 17:1, 216 (42%) had a ratio of 15:1, 157 (31%) had a ratio of 16:1, and 92 (18%) had a ratio of 14:1. He came to the conclusion that there was no consistent relationship between the MD of MCI and BZW. [19]

Berry's "biometric ratio" of 1:16 (MD of MCI to BZW), which was initially recorded nearly 100 years ago, formed the foundation for the Trubyte Tooth Selection Instrument, which still has its esteemed place in some literature.[20,21]

Our study depicted that there was a week correlation between Total of MD Width and Intercanthal Distance Bizygomatic Width Interpupillary nevertheless, Algarni AM et al. discovered a weak negative association (-.053) between the MD of MCI and BZW. These findings are similar to the research by Rawat A et al., where r=.007 for males and.03 for females.[22] However, in our study there were strong limitations which include uneven samples from different age group, less sample size.

Due to these limitations the generalizability of the results is questionable.

We aim to conduct the study on a larger sample size and take in account of the limitations and work for the same.

CONCLUSION

Under the limitations of the study, it can be said that the intercanthal distance and maxillary anterior teeth are extremely significant, whereas the interpupillary distance is moderately pertinent. Also, a considerable link was found between the square and tapered arch forms and bizygomatic width. The null hypothesis was also rejected in this case because all the variables help choose anterior teeth as they have a high to moderate association with the maxillary anterior teeth.

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