THE RELATIONSHIP BETWEEN WIDTHS OF UPPER ANTERIOR TEETH AND FACIAL WIDTHS

[1]SAMEEN BALEEGH

[2]ZIAULLAH CHOUDHRY

[3]SOFIA MALIK

[4]HASSAN BALEEGH

ABSTRACT

The scope of the study was to determine the ratio between maxillary anterior teeth widths to width of facial proportions in a dental college in Karachi, Pakistan.

The widths of facial proportions were determined using a Vernier Caliper. The widths of maxillary anterior teeth were measured intraorally using Boley's gauge on a sample of 116 human subjects visiting the Diagnosis Department in Dr Ishrat-ul-Ebad Khan Institute of Oral Health Sciences, (DIKIOHS), Dow University of Health Sciences, Karachi, Pakistan. All readings were measured in millimeters.

Pearson's correlation test was applied and it showed no significant relation between width of central incisor and bizygomatic width (0.11). But a significant relationship was found between intercanine width and width of mouth (0.03), width of philtrum and mean width of central incisors (p=0.05), interalar width and intercanine width (p=0.00).

Facial proportions solely do not provide a secure prototype in selecting maxillary anterior teeth and could result in selecting larger teeth in size.

Key Words: *Bizygomatic, mouth, philtrum, interalar, intercanine, central incisors.*

INTRODUCTION

Leon William's[1] found relationships between the size of face and the size of teeth. Hence, since then it became clear that, primarily the maxillary anterior teeth play a pivotal role in esthetics for edentulous patients and they should be in harmony with facial structures.[2] Lombardi's[3] further research in 1973 reinforced this idea. He stated that "the mold selected should have a pleasing proportion with facial anatomy and thereby harmonize with factors necessary to unify it with realism". It is safe to say that nobody prefers becoming edentulous or wants to remain as such. Edentulism has an important psychological impact on patients. Dentist should, therefore, play their role in maintaining their patients' psychological wellbeing during the dental rehabilitation period, first the patients' demand, ease during function, followed by pleasing esthetics and finally, efficiency.[3] Restoration of esthetics plays a pivotal part in Oral Rehabilitation Treatment. It refines patients' self-esteem, self-confidence and their social appearance.[4,9,10]

Berry has said that the width of the maxillary central incisor exists in a ratio of 1:16 to that of the bizygomatic width.[5] Later, House and Loop evaluated the ratio published by Berry, and found a range of ratios from 1:13 to 1:19, with 1:16 as an average midpoint.[5,6] A larger central incisor could be selected if facial measurements are used. However, Hardy was of the opinion that larger instead of smaller teeth should be selected for all patients.[7,8] Clapp and Tench published that the distal surfaces of the maxillary canines should be located at the commissural of the mouth, but Al Wazzan and colleagues found no correlation between the width of the mouth and the mesiodistal width of the upper anterior teeth.[9,10]

[1] Dr Sameen Baleegh, BDS, RDS, MDS Resident at Dow University Of Health Sciences, Karachi Cell: 0333-322-4204
Email: sameen.ab00@gmail.com

[2] **Correspondence:** C-243, Block-14, Gulistan-e-Jauhar, Karachi. Dr Ziaullah Choudhry, BDS, RDS, MSc UK, Assistant Professor, Prosthodontics, Department Dow University of Health Sciences, Karachi   Cell: 0300-829-11231
Email: choudhryziaullah@gmail.com

[3] Dr Sofia Malik, BDS, RDS, MSc UK, Assistant Professor, Department of Dental Materials, Dow University of Health Sciences, Karachi   Cell: 0324-200-6201
Email: drsofiamalik@gmail.com

[4] Dr Hassan Baleegh, BDS, RDS, MPH Australia, Practice Manager, Melbourne, Australia   Cell: 0061-402-540-702
Email: hbaleegh@gmail.com

Lee stated that a proportional relationship existed between the widest part of the nose and the front of the dental arch.[11,12] Picard[13] noted that the dimension of the anterior teeth from the distal surface of one maxillary canine to the distal surface of the opposing maxillary canine can be established through the use of Interalar Width; this relationship was also seen to exist amongst earlier researches.[14,15]

The Dentogenic Restorations[16] explained that to gurantee an optimal denture that is pleasing for the patient, it must exhibit the gender, qualities, social and cultural norms along with age attributes of that patient.[17,18,19] It is well-known that, shape, size and shade of prosthetic teeth should be confluent with the surrounding oral and facial structures and tissues.[20,21] Selecting and setting denture teeth to proper proportions are conducive to a natural and esthetic appearance.[22]

It has been seen that selecting the length of prosthetic teeth is easier compared to selecting their mesio-distal widths.[17,24,25] It becomes difficult to select teeth when no pre-extraction records like: photographs or casts are at the disposal of the dentist.[14,17,18] Some authors have inquired a relationship between few anthropometric measurements of the face and the mesiodistal width of the upper anterior teeth to define a ratio between tooth size and face size, which could be used as a guideline in selecting artificial denture teeth.[24,26]

Till date, no universally reliable and accepted method has been found for the selection of maxillary anterior teeth because of which many dentures exist that give an artificial appearance. Purpose of this descriptive study was to investigate the relationship between facial proportions and width of maxillary anterior teeth in anticipation that it would give a better understanding for dentists on fabricating more naturally appearing dentures for their patients which would also result in a higher patient satisfaction.

METHODOLOGY

A pilot study was first executed which comprised of 15 patients chosen randomly from the Department of Prosthodontics, DIKIOHS, Dow University of Health Sciences, Karachi, Pakistan. This pilot study was undertaken to check the feasibility and practicality of the study, if it were to be undertaken. Pilot study included 15 subjects and their facial dimensions and width of their maxillary anterior teeth was measured. After a few additions in the method of obtaining measurements, the pilot study was carried forward. A sample of 116 subjects was calculated using the online software OpenEpi. All the work was done by 1 operator to eliminate any intra-operator errors.

Patients with the following criteria were included for the present study; those with a permanent dentition, 14 years of age and above and have never undergone any orthodontic treatment to align their teeth, those who never had any extraction done in the maxillary arch and those with mild crowding and/or spacing equal to or less than 1mm. Following patients were excluded in this study; patients with mixed or any primary dentition, patients having space or crowding of more than 1 mm, patients with congenitally missing or supernumerary teeth and patients who received cosmetic dental treatment previously, were all excluded from the present study. A verbal consent was obtained from every patient before commencing the procedure for this descriptive study.

Bizygomatic width, width of mouth, interalar width, width of philtrum, intercanine width, and mean width of maxillary central incisors were measured using either vernier caliper or Boley's gauge.

Bizygomatic width was measured using a vernier caliper from the zygomatic prominence on one to the other side. A Boley's gauge was used to measure the width of mouth from commissure to commisure on both sides with the patient sitting in relaxed position. Width of philtrum was measured using a Boley's gauge from the two most prominent points on the base of philtrum. Similarly, a Boley's gauge was again used the measure the interalar width from the most bulbous part on one side of the nose to another. Widths of teeth were measured using the vernier caliper and obtaining a mean value of each set.

All the data collected were recorded on a specially designed proforma and this data were analyzed using the Pearson's correlation test. Significance of 0.05 was obtained with the help from the biostatistician.

RESULTS

The facial measurements showed a wide range: Bizygomatic width ranged from 76.8mm-126.30mm. Interalar width was in the range of 25.0mm-43.8mm. Width of mouth ranged from 30.8mm to 51.3mm and width of philtrum ranged from 8.3mm to 16.5mm. Ranges of all measurement remained high even when study sample was divided according to gender.

However, widths of teeth showed lesser variation: mean of both central incisors ranged from 6.9mm to 10.0mm and intercanine widths ranged from 25.3mm to 41.0mm. A Pearson's correlation test was applied between width of central incisor and Bizygomatic width (p=0.11) Ratio found was 1:19 compared to 1:16 found in a study done on American caucasians by Berry.[5] Width of mouth and intercanine width (p=0.03). Width of philtrum and width of both central incisors (p=0.05) and Interalar width and intercanine width (p=0.00).

Tables 1-4 show the mean value and level of significance for each of the facial measurements recorded. Fig 1 show the ratio between the genders who participated for the study. The correlation test corroborated a significant relationship between the above relationships except bizygomaticwidth, width of central incisor in the Pakistani population residing in the city of Karachi that presented in Ishratul Ebad Khan Institute of Oral Health Sciences, Dow University of Health Sciences.

TABLE 1: MEAN VALUES AND LEVEL OF SIGNIFICANCE

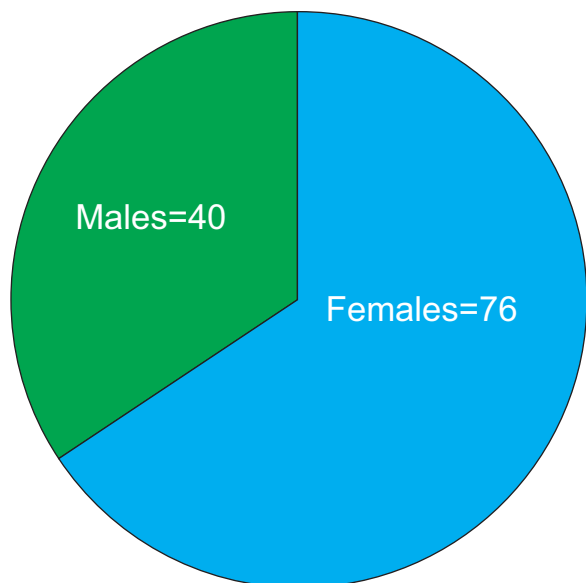|	Mean	P-value
Bizygomatic width	103.31 ± 7.62	0.11
Width of Central Incisor	8.28 ± 0.54	0.11
Width of Mouth	45.24 ± 5.20	0.03
Intercanine width	38.37 ± 2.81	0.03
Width of philtrum	12.64 ± 3.99	0.05
Combined width of both Central incisors	8.32 ± 0.49	0.05
Interalar width	33.60 ± 3.10	0.00
Intercanine width	38.37 ± 2.81	0.00

Fig 1: Pie chart showing the ratio between Men and Women participated in the study

DISCUSSION

The patient's motivation for undergoing replacement of missing teeth with partial or complete denture is paramount. Patients who have 'external' motivation involved, for example, those that have a successful career or those who seek to please others, are less likely to be happy with treatment provided than patients who have 'internal' motivation, which is that they want to look and appear better for themselves.

During the fabrication of removable complete dentures, most find it harder to establish mesio-distal widths than lengths of teeth.[17,24,25] It becomes even harder to select prosthetic teeth when no pre-extraction records like photographs, casts are available[15,18,24] Some authors have inquired a relationship between few anthropometric measurements of the face and the mesiodistal width of the upper anterior teeth to define a ratio between tooth size and face size, which could be used as a guideline in selecting artificial denture teeth.[15,24,26]

No correlation was found in the present study linking the width of central incisor and bizygomatic width. 9.48% had 1:16 proportion and majority 45.69% fell in the proportion 1:12. These results are in harmony with La Vere et al[7,27,28] who found that 23% of the subjects had the 1.16 ratio and the 53% had smaller bizygomatic width.

In this study 84.67% subjects had the intercanine distance within 4mm of the width of the mouth and this was established by ascertaining the width of mouth from commissure to commissure in a relaxed state. John H. Lee[11,12] reported that combined mesio-distal width of maxillary central incisor to be equal to width of Philtrum. Present study showed 65.87% subjects in accordance with John Lee's findings.

Present study also showed that intercanine width (38.33mm) is 15% greater than interalar width (33.59mm) which shows a proportional relationship between interalar width and intercanine width. This is in accordance to an earlier study.[22] Because most of these methods of establishing esthetic specification exhibit questionable validity, many dentures exhibit an obvious artificial look. Hence present study was designed to investigate the prospective relationships because no universally accepted guideline currently exists for the selection of anterior teeth.

The results of the present study showed that the above mentioned 4 facial measurements are in accordance to the earlier research[2,14,14,22] but these are performed in a small proportion of the community and hence, cannot be generalized for the mass population. Consequently, these measurements do not provide a dependable method to decide the width of maxillary anterior teeth relative to facial widths.

Although, they can be used as a preliminary guide combined with other facial measurements or other methods to govern the size of teeth. Albeit, the ultimate decision should be taken at the try-in stage along with the patient's desire.

CONCLUSION

Present study showed that the four facial measurements do not provide dependable method in selection of anterior teeth in denture fabrication. However, they can be used in the initial step, or in combination with other methods for selection of anterior teeth in denture construction.

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CONTRIBUTION BY AUTHORS

1   **Sameen Baleegh:**   Data collection & article drafting.

2   **Ziaullah Choudhry:**   Topic, design selection, revision.

3   **Sofia Malik:**   Literature review.

4   **Hassan Baleegh:**   Reference selection, helped in revision.