



Estimation of Maxillary Anterior Teeth Width with Golden Proportion in Undergraduate Students

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Aim: To estimate the frequency of coinciding width of maxillary front teeth and golden proportion ratio in undergraduate students.

Study design: Descriptive Cross Sectional

Place and Duration of Study: Department of Prosthodontics, Liaquat Medical University Hospital from June 2019 to January 2020.

Methodology: Total numbers of 96 students with maxillary anterior teeth were selected in this study. Appropriate size of upper maxillary impression of maxillary arch was made using alginate impression material with manufacturer prescribed instructions. The cast was retrieved between one and three hours of pouring. Digital caliper was used to measure for the spaces in the. The final recordings were entered in proforma. The data was analyzed by SPSS version-20.

Results: Among the participants 65% were males and 35% females. The mean age of the

participants was 21.02 ± 1.88 years. Rate of coinciding was significantly high in 18 to 20 years of age ($p=0.032$). Coinciding width of maxillary anterior teeth and golden proportion ratio was significantly high in 1st year student ($p=0.038$)

Conclusion: It was concluded that esthetics in dentistry cannot be justified mathematically and individuals should not be standardized. Whereas the dentists should follow few fundamental guidelines in the planning for esthetic treatment, it should be acknowledged that esthetics alters from person to person. That's why it is important to consider the dento-facial specificities of every person and the inconstant natural tooth proportion during restoration or replacement of the maxillary front teeth.

Keywords: Coinciding; maxillary anterior teeth; golden proportion.

1. INTRODUCTION

The replacement of missing maxillary anterior teeth not only addresses restoration of the function, tissues health but the esthetics as well [1]. To achieve maximum aesthetics outcome in an artificial prosthesis one has to consider different aspects such as size, shape, colour and material of teeth are different in every individual regarding their personality and shape of face [1,2] Amongst the above mention factors, size of the teeth is the most important to fulfill aesthetics consideration. Therefore, many scientists used different anatomic landmarks to aid in determining the correct size of front teeth, including bi-zygomatic width, inter-pupillary distance, inter canthal distance, inter-alar width, and inter commissural width [3]. The esthetic smile is achieved by changing the proportions of the mesio-distal widths of maxillary front teeth during restoring or replacing them [4]. Few authors have mentioned utilization of golden proportion ratio in restoration of anterior aesthetic and stated it as a reliable parameter [2-4]. It is also an important tool for the assessment of symmetry, proportion in the diagnosis of tooth arrangement and use of dental esthetics [5]. Conflicting data also provided by some authors revealed that the majority of the esthetic smiles do not have proportions coinciding with the golden proportion formula [6]. The Chander's reported that the golden proportion ratio was not coinciding between width of central & lateral incisors, as he got 53% in women & 47% in men. One study observed dentist's preference for anterior tooth proportion and reported minimal correlation between beautiful smiles and the golden proportion [7]. Due to difference in some studies, there is confusion for both clinicians and technicians. No research in this field has been conducted in our local population as our population is genetically and geographically varies from other population, so the use of results is not possible in our population.

Therefore, the objective for this study was to evaluate the width of 6 maxillary front teeth with golden proportion in undergraduate dental students. This study would be beneficial for all prosthodontists for the use of appropriate width of anterior teeth for achievement of better aesthetics.

2. MATERIAL AND METHODS

This study was conducted at Institute of Dentistry Liaquat University of Medical and Health Sciences Jamshoro. It was initiated six month after approval of synopsis. Calculation of sample was done by WHO sample size calculator. Using proportion of population 47% with 95% confidential level and 10% margin of error the sample size stands to be 96 [7].

Inclusion criteria were undergraduate Students, age from 18-25 years, maxillary anterior teeth, both genders. The exclusion criteria were missing anterior teeth, gingival and periodontal problems, facial deformity, dental anomalies, restorations (Crown & bridge) on anterior teeth, and history of Orthodontic treatment. Volunteer students who were fulfilling the inclusion criteria were selected for study after taking written informed consent.

2.1 Data Collection Procedure

The study was explained to the volunteers' in their mode of language. First step was the selection of impression tray. Appropriate size of upper maxillary impression of maxillary arch was made using alginate impression material i.e Cavex CA37 – Alginate (Cavex Holland BVTM) with manufacturer prescribed instructions. Recommended scoop of powder and measured amount of water was added in a rubber bowl, both powder and water were mixed with help of metal spatula. The impression tray was loaded with the impression material, seated in oral cavity

and kept still until set. After the removal of impression, it was washed under running tap water and disinfected for one minute. The impression was poured with type III dental stone i.e Kopo-Hard CKH-52 (Kuangpang Gypsum Enterprise) within 12 minutes. The manufacturer-recommended powder/liquid ratios were used for pouring. Care was taken to prevent incorporation of air bubbles during impression pouring. The cast was retrieved between one and three hours of pouring. The casts was trimmed, washed, and allowed to bench dry for 24 hours. The perceived width of anterior teeth viewed from front was measured using a digital caliper read to the nearest 0.01mm evaluations regarding the accuracy of golden proportions was conducted by drawings of grids that obtained by placing the cast on a flat surface and drawing verticals lines representing the perceived mesio distal widths of the teeth. Measurement was done for the spaces in the grids using a digital caliper. The measurement was recorded three times and the average was considered as the final value. The final recording was entered in proforma. One operator performed all the measurements.

Data was analyzed by using Statistical Package for social sciences (SPSS) software 20. Mean &

standard deviation was calculated for quantitative variables like age, width of maxillary anterior teeth and golden proportion. Frequency & percentage was calculated for qualitative variable like gender. Chi Square test was applied. P value<0.05 was considered as significant.

3. RESULTS

A total of 96 participants with maxillary anterior teeth were selected in this study. The average age of the students was 21.02±1.88 years. There were 65% males and 35% females. Educational status of the participants is shown in Fig.1. Mean of width of maxillary front teeth in millimeters and golden proportion is reported in Table 1 and 2. Frequency of coinciding width of maxillary anterior teeth and golden proportion ratio in under graduate students was observed in 10%. Rate of coinciding was significantly high in 18 to 20 years of age as compared to above 20 age groups (p=0.032). It was also not observed significant between male and female (p=0.281). Frequency of coinciding width of maxillary anterior teeth and golden proportion ratio was significantly high in 1st year student (p=0.038).

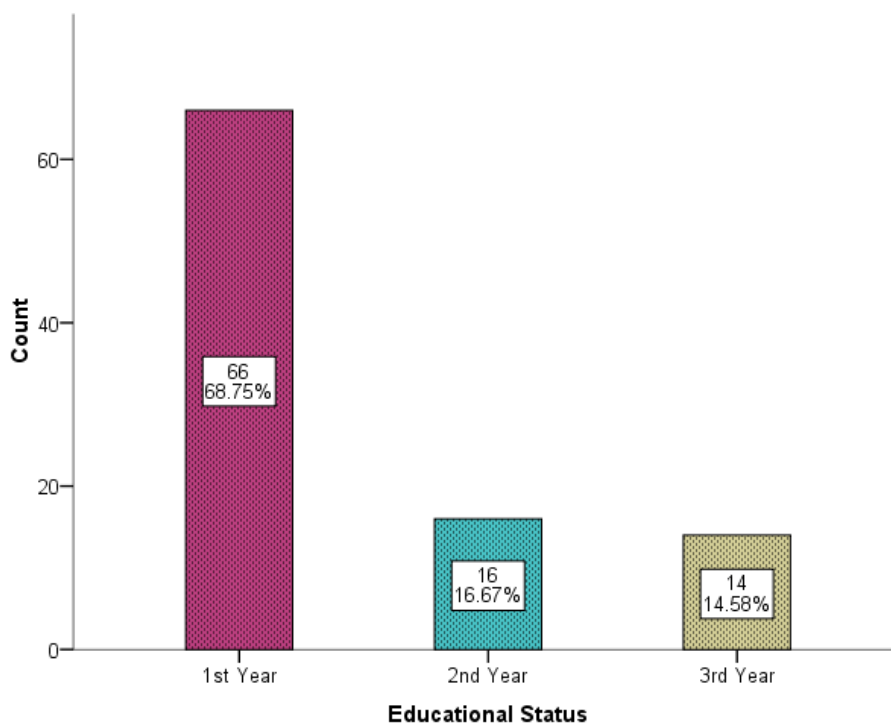


Fig. 1. Educational level of undergraduates student n=96

Table 1. Mean width of maxillary anterior teeth in millimeters

	Mean	Std. Deviation	95%Confidence Interval for Mean	
			Lower Bound	Upper Bound
Right Central incisor	8.52	0.80	8.35	8.68
Right Lateral incisor	4.40	0.61	4.28	4.52
Right Canine	5.90	0.45	5.81	5.99
Left Central incisor	8.49	1.36	8.21	8.77
Left Lateral incisor	4.42	0.60	4.30	4.55
Left Canine	5.82	0.46	5.72	5.92

Table 2. Mean golden proportion ratio

Golden Proportion	Mean	Std. Deviation	95%Confidence Interval for Mean	
			Lower Bound	Upper Bound
Right Lateral incisor/ Right Central incisor	69.07	9.01	67.24	70.89
Right Lateral incisor/ Right Canine	74.51	8.07	72.87	76.14
Left Lateral incisor/ Left Central incisor	67.35	6.22	66.09	68.61
Left Lateral incisor/ Left Canine	74.87	8.18	73.21	76.53

Table 3. Frequency of coinciding width of maxillary anterior teeth and golden proportion ratio in undergraduate students by age group n=96

Age groups	Coinciding		Total	P-Value
	Yes	No		
<=20 Years	8 (17.4%)	38 (82.6%)	46	0.032
21-25Years	2(4%)	48(96%)	50	

Chi-square=4.604

4. DISCUSSION

To achieve balance proportion during the restoring or replacing maxillary front teeth is challenging job in aesthetic dentistry [8]. If the restored teeth are not in balance then the psycho-social problems might develop [9]. It is observed that the cornerstone of smile design theory is the Golden [10]. The mathematically Golden Proportion shows ratio of smaller to a larger [11]. Ward suggested that the proportion of successive width of teeth remaining constant when progressing distally from the midline and that proportion named as Recurring Esthetic Dental proportion [12]. Snow suggested that Golden Proportion as a bilateral analysis for the width of six front teeth Nepal Rokaya et al. had carried out similar study and reported that Golden Proportion cannot be used and suggested the new proportion from their study as “Nepalese esthetic dental proportion”[13]. In our study the mean age of the participants was study [14] 21.02±1.88 year. Among them 64.58% were male and 35.42% female. In Maharjan and Joshi included 63 participants in his study in which 47.6% were female and 52.4% were male.

Conflicting reports also has been given by some authors revealed that the majority of the beautiful smiles did not have the proportions coinciding with the golden proportion formula [15] Similarly, another study by Chander’s [5] revealed that the golden proportion ratio was not coinciding between width of central & lateral incisors, the results were 53% in women and 47% in men. One more study evaluated dentist’s preference for anterior tooth proportion also found minimal correlation between beautiful smiles and the golden proportion [8].

In this study frequency of coinciding width of maxillary anterior teeth and golden proportion ratio in under graduate students was observed in 10.42%. The result of the Maharjan and Joshi study [16] revealed the golden proportion was 14.28% between central and lateral incisor. Golden proportion was appeared in 12.69% between canine and lateral incisor. Therefore, overall result in this study revealed that the golden proportion does not seem to exist which is in agreement with the study results of Fayyad et al [17]. They reported for the students with esthetic smile and assessed the presence of golden proportion by evaluating the mesio-distal

width of six anterior teeth using frontal images. They reported that golden proportion did not exist in natural dentition in their context as the golden proportion was found only in 38.2% between central and lateral incisor and 15.2% between lateral incisor and canine [13]. In similar study conducted by Murthy and Ramani [18] found that out of 56 subjects the golden proportion existed in 17.9%(left central incisor to left lateral incisor), in 25% (left lateral incisor to left canines), in 16.1% (right central incisor to right lateral incisor) and in 14.3% (right lateral incisor to right canine).

Golden proportion in dentistry mathematically measures the ratio between a larger and shorter length with the larger length equivalent to phi [19]. It has been commonly associated with fields of art, architecture, science and philosophy. Preston observed only 17% of the population in his research showed the presence of golden proportion in the widths of maxillary central and lateral incisors [20]. He determined that golden proportion did not exist between maxillary lateral incisors and canines. Gillen and colleagues had found low relation between the tooth widths and the golden proportion [21].

Golden proportion should not be taken as a single ratio to have a satisfactory appearance but it should be used as a range. [22,23] in order to have a good esthetic, evaluation of a geometrical and mathematical relationship between anterior teeth is important. A statistically reliable value described in the form of range to support the reported theories in esthetic parameter would benefit more clinically for dental practitioners.[24] Further studies are recommended and should be researched on a larger sample with equal male to female ratio; in order to evaluate any gender difference really exists. Further studies should be carried out that account for populations belonging different to Asian ethnicities as well; in an attempt to obtain racial and/or ethnic variabilities. This would allow the clinicians for good understanding and designing the "treatment plan phase" while considering the esthetic need of patients.

5. CONCLUSION

It was concluded that the frequency of coinciding width of maxillary anterior teeth and golden proportion ratio in under graduate students was observed in 10%.Rate of coinciding was significantly high in 18 to 20 years of age. Frequency of coinciding width of maxillary anterior teeth and golden proportion ratio was

significantly high in 1st year student. Esthetics in dentistry cannot be justified mathematically; all individuals should not be standardized in the same way. Individual cultural characteristics and perceptions of beauty must be considered.

DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

CONSENT

The written informed consent was taken from each patient prior to study. The confidentiality was maintained.

ETHICAL APPROVAL

The ethical permission was sought from the Ethical Review Committee (ERC) of the CPSP, Karachi, Pakistan. Thesis approval Reference No: CPSP/REU/DSG-2016-166-1777 Dated: July 22, 2020.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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