

GOLDEN PERCENTAGE IN NATURAL MAXILLARY ANTERIOR TEETH IN AMONG STUDENTS OF A DENTAL COLLEGE

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ABSTRACT

Objective: To establish the presence of golden percentage in natural anterior maxillary dentition

Materials and Methods: A cross-sectional study was carried out among the students of a public sector dental college, fulfilling the inclusion criteria. The golden percentage for each anterior tooth was acquired after measuring the widths of anterior teeth from the cast in frontal view. Anterior arch width was measured from the distal contact point of right side to the distal contact point of left side in frontal view. Data were analyzed using SPSS 17.

Results: 100 subjects were included in the study, the majority of them 21 years old. The mean arch width measured was 43.31 ± 3.24 mm. Golden percentage values calculated for the lateral incisors matched with those recommended by Snow whereas those for the central incisors and canines did not match. The widths of right and left central incisors showed significant statistical difference (p value=0.007).

Conclusion: the natural anterior dentition was not found to exhibit a golden percentage as proposed by Snow. Esthetics is a diverse phenomenon and perceived subjectively. The application of mathematical proportions to the natural dentition would require modifications.

Keywords: golden percentage, golden proportion, esthetics, anterior arch width.

INTRODUCTION

Thoroughly explicit principles dictate dental esthetics, which can be applied to assess and modify dental esthetics after individually evaluating and establishing them for each case.^{3,4,5} The application of mathematical proportions in esthetic dentistry has remained an important aspect, many theories have been proposed to satisfy the esthetic demands in this aspect the important ones include golden proportion, golden percentage and recurrent esthetic dental (RED).¹

Recurrent esthetic dental (RED) was proposed by Ward after his study, where he described the succeeding widths of anterior teeth to remain consistent moving distally from the midline. The single width

of anterior maxillary teeth was linked in “golden proportion” by Levin. Snow, in his efforts to further enhance an esthetically pleasing smile described “golden percentage” in which the proportional dimension of each anterior tooth is represented as a proportion of the overall dimension of the anterior teeth. Snow proposed the golden percentage values for Canine as 10%, Lateral incisor as 15%, Central Incisor as 25% (for each side) of the total width of the anterior maxillary segment.^{1,4,7.}

The widths of anterior maxillary teeth were related in “golden proportion” by Levin. Many researchers worked upon golden proportion, but Lombardi was one of the first to explain the application of golden proportion in anterior region. He argued use of a “repeated ratio” in anterior maxillary region to improve esthetics. The ratio of larger to smaller component was described as 1.618:1 in frontal view remaining same moving distally from midline.⁶ It looks an ideal ratio to evaluate symmetry

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in managing dental esthetics, but it was described as a theoretical ratio and its application challenging by many researchers who studied the occurrence and clinical implications of golden proportion in natural dentition.^{1, 8, 11, 12} Preston challenged the universal application of golden proportion for the dental esthetic treatment in maxillary anterior segment and described his results of a study where merely 17% of the studied sample demonstrated golden proportion between the widths of maxillary central and lateral incisors.⁷ The claim by Preston was endorsed by Hasanreisoglu et al. who refuted the existence of golden proportion in his study of population sample with natural teeth, observing variations in the dimensions of central incisor and canine widths with gender.¹⁰

As evident, different studies have reported the presence and absence of golden proportion in the natural anterior teeth. This uncertainty relating to the golden percentage led us to analyze the existence and suitability of the golden percentage between the widths of anterior maxillary teeth in individuals with natural dentition. No reliable data is available for the local population to dictate the esthetic analysis and design smiles of patients seeking esthetic treatment of anterior teeth. The rationale of this study is to provide such data that might be utilized by the clinicians in planning smiles satisfying aesthetic principles.

MATERIALS AND METHODS

One hundred volunteers, all dental students in the age range 18-26 years, were included in the study. The study was conducted over six months from March 2016 to August 2016. All the patients had their natural esthetic teeth, i.e., maxillary anterior six teeth, present. The subjects included in the study volunteered themselves for the study, had a full set of natural dentition, no history of orthodontic or orthognathic treatment, spacing or crowding in the anterior teeth, any restorations, a history of periodontal treatment, dentoalveolar trauma, or any dentofacial deformity or asymmetry in the anterior region. The subjects were selected through the following nonprobability method for this cross-sectional descriptive study.

The entire procedure was made simple; a maxillary cast of each subject was obtained after recording impression with irreversible hydrocolloid material in a stock tray. The cast was positioned on a card such

that the midpalatal raphe is parallel to and along the midsagittal axis (Line 2) and perpendicular to another line parallel to the coronal axis (Line 1) as shown in figure 1. The widths of the anterior teeth were measured by drawing perpendicular lines on Line 1 from the mesial and distal ends of the teeth visible in frontal view. Dimensions of the anterior teeth were measured with a millimeters ruler bilaterally. The total width of all the anterior teeth in frontal view was also recorded. Each measurement was repeated thrice by the operator and a mean value taken to obtain accurate results.

The null hypothesis we began our work with was that the golden percentage was not present in most of the analyzed cases.

The width of each anterior tooth was divided upon the anterior arch width and multiplied by 100 to obtain a golden percentage for each tooth. The anterior teeth would conform to the golden percentage proposed by Snow when they show the individual percentages like 10, 15 and 25% for each canine, lateral incisor and central incisor respectively. The acquired data were analyzed using statistical software SPSS 17. A chi-square test was used to analyze any differences present among male and female groups. The paired-sample t-test was used to analyze the differences between the right and left sides for the frontal teeth of each subject.

RESULTS

The mean age was 22.34 with SD of 2.293 of the 100 subjects included in the study. 56% of the subjects were females. The age range was 18-26 years, with maximum number of subjects 21 years old (17%).

The total arch width was recorded in the frontal view from the distal contact point of right canine to the distal contact point of left canine. The mean arch width measured was 43.31 ± 3.24 mm. The individual widths of all the six maxillary anterior teeth were also recorded. (Table 1)

The golden percentage values for individual teeth were obtained. The values measured for the lateral incisors were found to coincide whereas the values for the central incisors and canines did not match with those recommended by Snow (Table 2).

A chi-square test was applied to find any significant difference between the two genders. Chi-square

Table 1. Mean widths of all the anterior teeth

	LCaW	LLIW	LCIW	RCIW	RLIW	RCaW
N	100	100	100	100	100	100
Mean (mm)	5.291	6.662	9.643	9.489	6.816	5.404
SD	0.620	0.978	0.908	0.760	0.896	0.561

(LCaW=Left Canine width, LLIW= Left Lateral Incisor width, LCIW= Left Central Incisor width,

RCIW= Right Central Incisor width, RLIW= Right lateral Incisor width, RCaW= Right Canine width, SD= Standard Deviation, N= Frequency)

Table 2. Golden percentages calculated in studied cases

	RCA	RLI	RCI	LCI	LLI	LCA
N	100	100	100	100	100	100
Mean (%)	12.53	15.69	21.94	22.25	15.35	12.32

(RCA= Golden percentage for the Right canine, RLI=Golden percentage for the right lateral incisor, RCI=Golden percentage for the right central incisor, LCI= golden percentage for the left central incisor, LLI= golden percentage for the left lateral incisor, LCA= golden percentage for the left canine, N= frequency)

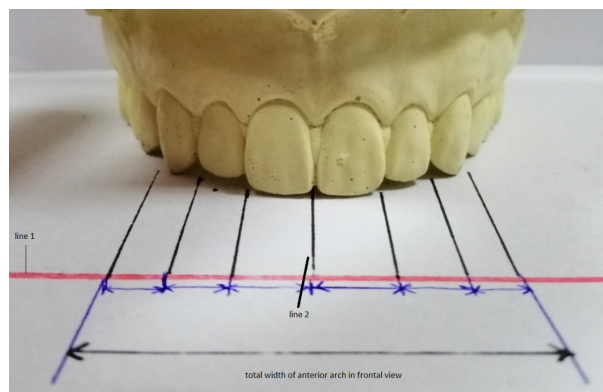


Figure 1 showing the method for measurement of widths of anterior teeth and total arch width in frontal view. (Line 1 corresponds to a line parallel to the coronal plane and perpendicular to line 2 that corresponds with the midsagittal axis).

test revealed no significant difference between males and females ($p=0.45$).

The paired t-test was applied to analyze any statistically significant difference between the widths of the teeth on the right and left sides when viewed from the frontal aspect. No significant difference was observed between the right and left sides ($p=0.427$). The widths of left and right central incisors showed statistically significant differences. ($p = 0.007$).

DISCUSSION

A geometrical relationship, i.e. golden proportion was suggested to exist between the anterior dentition for an appealing smile. Lombardi was one

of the pioneers to have suggested the existence of this mathematical proportion to existing in the natural dentition. Levin, Snow, and George, and Bhatt in their respective studies validated the presence of golden proportion^{2,6}. However, Preston⁶, Mahshid et al., and Hasanreisoglu et al.¹⁰ in their studies negated the presence of golden proportion. This contradiction among the researchers and absence of such reliable data for our local population directed this study to evaluate the existence of golden proportion among anterior teeth.

The golden percentage values of lateral incisors obtained in this study were confluent with those proposed by Snow. The results of the present investigation revealed the mean golden percentage for the right lateral incisor to be 15.6% and the same for the left lateral incisor to be 15.35%. The mean value for the central incisors was 21.9% for the right side and 22.2% for the left side. As far as the golden percentage for canines is concerned, this study revealed a mean value of 12.5% for the right side and 12.3% for the left side.

The golden percentage values attained for the central incisors are slightly lower than those recommended by Snow, who estimated 25% for central incisors. The canines have a slightly higher values than suggested by Snow, who proposed a value of 10 for canines.⁶ The results obtained in this study are in agreement with those reported by Murthy et al.⁴ and Marckovics et al.⁹

As opposed to the values proposed by Snow in his theory of golden percentage, the values from this study show variations. Natural dentition exhibits many variations, with each human having distinct facial and esthetic features. As the golden percentage theory presumes the natural dentition to exhibit geometric and mathematical proportions, it becomes impractical and more theoretical. For the esthetics to be acceptable, all the major and minor aspects need to be taken into consideration. Pakistan has a diverse cultural and racial variations among the different races occupying the land. The universal application of a single factor affecting esthetics may, therefore, become illogical.

CONCLUSION

The natural anterior dentition does not exhibit the percentages proposed by Snow. Thus the golden percentage cannot be a common factor in esthetic smiles. The values obtained for the lateral incisors in this study fall within the values suggested by Snow. However, with some modifications the golden percentages of Snow can be made valid to the natural esthetic dentition on a broader scale. Aesthetics is a diverse phenomenon and a subjective perception; it cannot be constrained within the limits of mathematical percentages and proportions. Therefore, it is difficult to standardize. Though specific fundamental theories are helpful, the facial and dental features of the subjects, the diversity of natural teeth and the individual perception of esthetics must be considered when planning for the esthetic restorations.

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