Research Article

Incidence of golden proportion among a target South Indian population

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ABSTRACT

Background: There are certain esthetic algorithms in nature like the Fibonacci sequence and the closely related golden proportion. In dentistry, the golden proportion has been suggested as one possible mathematical approach to the development of ideal size and shape relationships for maxillary teeth. Although several studies are available regarding the measurement of golden proportion in Caucasian populations, we do not have enough data regarding golden proportion measurements in the South Indian population. This survey is a small step toward addressing this gap in the literature. **Aim:** This study aims to survey the incidence of golden proportion between the widths of the maxillary anterior teeth among a target South Indian population. **Materials and Methods:** The study included 100 patients, 50 male and 50 female patients of age group of 20–30 years. Digital camera was used to measure the widths of the maxillary anterior teeth: Central incisor, lateral incisor, and canine. Standard frontal image of subject's smile was taken using Canon 550 AF Lens 18–55mm. The image was downloaded to a personal computer and measurements of maxillary and mandibular anteriors were measured using a software called image measurement.**Results:** In the present study male South Indian population, the central incisor is smaller when compared to the ideal golden proportion, whereas canine is larger. The ratio of 1.2 was more commonly observed in 89% of individuals than 1.618 and 1.3 only in 11% of samples. **Conclusion:** The proportion between the maxillary central incisor, lateral incisor, and canine is consistent in both males and females. The central incisor is slightly smaller and canine is larger than the ideal golden proportion.

KEY WORDS: Central incisor, Esthetics, Females, Golden proportion, Males

INTRODUCTION

One of the critical aspects of esthetic dentistry is creating geometric or mathematical proportion to relate the successive width of anterior teeth. Golden proportion, golden percentage, and recurring esthetic dental theories are utilized in esthetics.[1] Lombardi was the first to suggest the application of the golden proportion in dentistry. He said that the golden proportion was used in determining tooth size. He also described the use of repeated ratio in the maxillary anterior teeth.[2] This implies that an optimized dentofacial composition of the lateral to central incisor width and the canine to lateral incisor width is repeated in proportion. Levin suggested the use of the theory of golden proportion to relate the successive width of the anterior teeth, as viewed from the labial aspect. He said that the width of the central incisor should be in golden proportion to the width of the lateral incisor and that the lateral incisor should be in golden proportion to the width of the canine when viewed from the front. In addition, he devised a grid with the spaces in golden proportion and advocated the use of this grid to evaluate and develop harmonious proportions of teeth.[3] The golden proportion (1.618:1.0) is a mathematically constant ratio that defines the dimensions between larger and a smaller length. This specific relation is unique, perfect, ideal, and desirable. It is also a valuable tool for the evaluation of symmetry, dominance, and proportion in the diagnosis of tooth arrangement and in the application of esthetic dental treatment. On the contrary, the researchers found that the usage of the golden proportion is theoretical and its application is challenging.[4-9] The studies have shown both the presence and the disapproval of golden proportion. The uncertainty of golden proportion in esthetic analysis and in smile design intended this study to evaluate the existence or presence of golden proportion in South Indian population.

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MATERIALS AND METHODS

The study was conducted in the Department of Prosthodontics, Saveetha Dental College and Hospitals, Saveetha University, Chennai, India. The study included 100 patients which included 50 male and 50 female patients of age group of 20–30 years. The patients for the study were selected based on the inclusion and exclusion criteria. The volunteers were of Indian origin, their consent and ethical clearances were obtained from the institutional ethical committee for the study.

Inclusion Criteria

- Subjects of South Indian origin.
- Natural anterior teeth in maxillary arch.
- No history of dental anomalies associated with tooth size and morphology alteration.
- No history of orthodontic treatment.

Exclusion Criteria

- Teeth having maxillary anterior restorations or a history of trauma or maxillofacial surgery.
- Presence of rotation, spacing, or crowding.
- Presence of severe dentofacial deformities or obvious asymmetries.
- Artificial crowns.

Patients were evaluated under normal clinical set up. Digital camera was used to measure the widths of the maxillary anterior teeth: Central incisor, lateral incisor, and canine. Standard frontal image of subject's smile was taken using Canon 550 AF Lens 18–55 mm. The subjects were positioned in natural head position with the occlusal plane parallel to the floor. The camera is adjusted to obtain clear sharp images. The distance of the subject and the camera is 100 cm. The camera is stabilized with the help of a tripod at this fixed distance. The subject was asked to smile and the image was captured during smile. The image was downloaded to a personal computer and measurements of maxillary and mandibular anteriors were measured using a software called image measurement. Each measurement was repeated to reduce the error involved and the repetitive value was used for accurate readings. The width of the central incisor and lateral incisor was measured at the mesiodistal contact point of the teeth. The width of the canine was measure from the mesial contact point to the distal most visible area from the frontal view [Figure 1].

The golden proportion for each subject was assessed by multiplying the width of the larger component by 62% and compared the width of the smaller component for proportion to be analyzed. The width of central incisor was multiplied by 62% and compared with the width of the adjacent lateral incisor. Similarly, the width of the lateral incisor, canine, and the maxillary and mandibular teeth was evaluated for golden proportion. The measurements were recorded and statistically analyzed using Chi-square test.

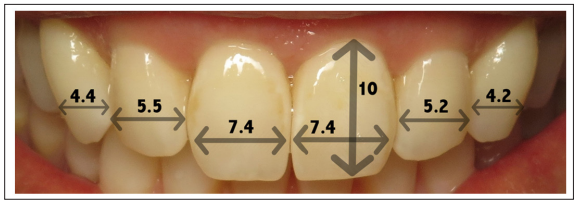

Figure 1: Measurement of golden proportion

Golden proportion: 1/x+1 (Where x is the width of tooth).

RESULTS

Data obtained were entered into Microsoft Excel sheet and analyzed statistically using SPSS statistical package version No. 10. Descriptive statistics were calculated for the frequency of participants having various ratios of golden proportions based on sex. Chi-square analysis was used to find if there exists any association between sex and various ratios of golden proportions. In the present study male South Indian population, the central incisor is smaller when compared to the ideal golden proportion, whereas canine is larger [Table 1]. We found a similar ratio in female population which shows the consistency in relative proportion of the anterior teeth in both the sexes. The ratio of 1.2 was more commonly observed in 89% of individuals than 1.618 and 1.3 only in 11% of samples [Figures 2 and 3].

Ratio:

Male: Right (1.12:1:1.12), Left (1.12:1:1.12)
Female: Right (1.12:1:1.12), Left (1.12:1:1.12)

DISCUSSION

Various researchers have opinion against the use of this mathematic proportion in dentistry.[1-9] The golden proportion (1.618:1.0) describes the ratio between the dimensions of a larger and a smaller length. Mahshid *et al.*[10] reported that the golden proportion did not exist between the widths of the maxillary anterior teeth and it was substantiated by Ward,[4] Gillen *et al.*,[11] Rosenstiel *et al.*,[12] and Levin[3] observed the golden proportion between the width of central incisor, lateral incisor, and the canine. Lombardi[2] recommended a repeated ratio concept in contrast to golden proportion. The variation of thoughts among researchers[2-4,10-12] and lack of similar study on South Indian population aimed this study to evaluate the existence of golden proportion between anterior teeth in the Indian population.

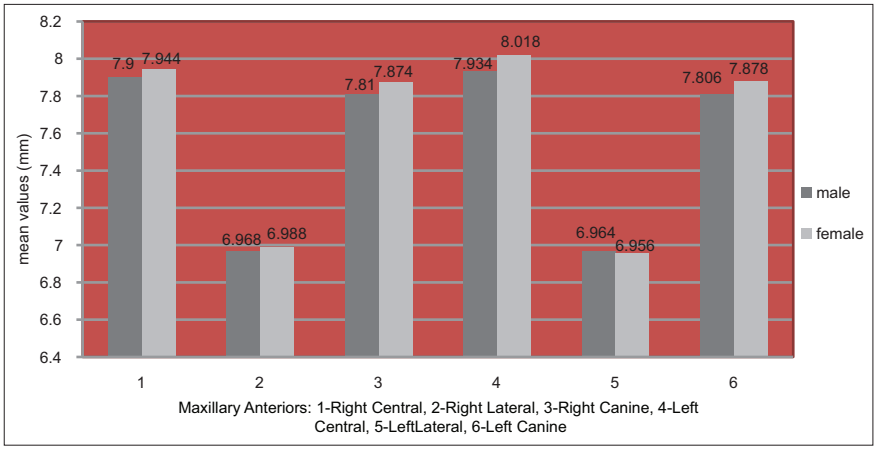

Figure 2: Mean of central, lateral incisor, and canine of males and females

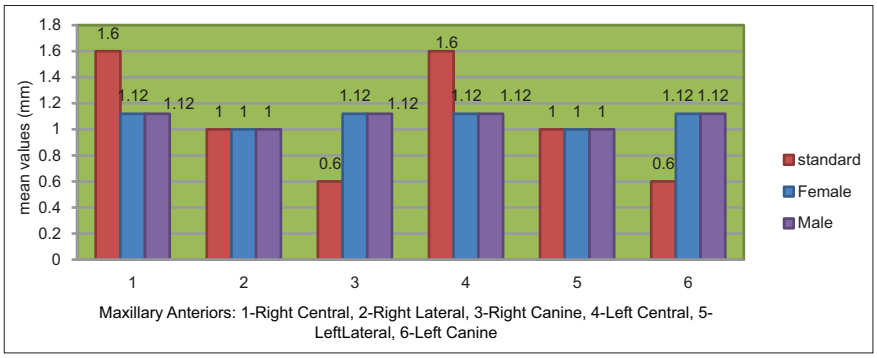

Figure 3: Ratio of golden proportion in males and females

Table 1: Mean of central, lateral incisor, and canine of males and females

S.no.	Sex	11 (mm)	12 (mm)	13 (mm)	21 (mm)	22 (mm)	23 (mm)
Mean	Females	7.9	6.968	7.81	7.934	6.964	7.806
	Males	7.944	6.988	7.874	8.018	6.956	7.878

The result of the study indicated that golden proportion did exist in majority of the South Indian population. The ratio of 1.2 was more commonly observed in 89% of individuals than 1.618. The 1.2 ratio which was commonly observed is substantiated by Rosenstiel *et al.*[12] Golden proportion to be a superior aspect of esthetics, but the proportion is more artistic, theoretical, and impractical in nature. It is also inappropriate to anticipate for every patient to possess this precise relationship because humans are individuals with unique facial and dental features.

The adherence to a particular proportion for all patients universally is impractical.[13-19] The results of this study showed existence of specific ratio of 1.2 in 89% of study samples and 1.3 only in 11% of samples. No major differences in proportion existed between the sexes. The results of this study have inferred that golden proportion is seen in majority of South Indian population. Unlike other studies,[17-23] the sample size selected for the study is superior but larger group is required to obtain definitive conclusions on South Indian population which varies with cultural diversity.

CONCLUSION

In the above study analyzing 50 males and 50 females patients in a target South Indian population, the proportion between the maxillary central incisor, lateral incisor, and canine is consistent in both males and females. The central incisor is slightly smaller and canine is larger than the ideal golden proportion. Hence, while replacing or restoring maxillary anterior teeth for the South Indian population, the difference from ideal golden proportion may be applied clinically.

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