



## EVALUATION OF GOLDEN PROPORTION BETWEEN MAXILLARY ANTERIOR TEETH IN THE POPULATION OF ALIGARH, U.P., INDIA

**Abhinav Gupta<sup>1</sup>, Sabzar Abdullah<sup>2</sup>, Afzal Admad<sup>3</sup> and Pranshu Varshney\*<sup>4</sup>**

<sup>1</sup>Associate Professor, Department of Prosthodontics, Dr. ZA Dental College, AMU, Aligarh.

<sup>2</sup>Assistant Professor, Department of Prosthodontics, Dr. Z.A. Dental College, AMU, Aligarh.

<sup>3</sup> and <sup>4</sup>Resident, Dr. Z.A. Dental College, AMU, Aligarh.

**\*Corresponding Author: Dr. Pranshu Varshney**

Resident, Dr. Z.A. Dental College, AMU, Aligarh.

Article Received on 22/01/2018

Article Revised on 12/02/2018

Article Accepted on 05/03/2018

### ABSTRACT

**Background:** The need of cosmetic dentistry in this era is to make consonance proportions between the widths of maxillary anterior teeth when making the prosthesis to replace these teeth. The “golden proportion” is an important guideline introduced in cosmetic dentistry. **Purpose:** The objective of this study was to enquire into the existence of golden proportion between the widths of the maxillary anterior teeth in population of Aligarh, U.P. India. **Materials and Methods:** The clinical tooth width was measured using digital vernier caliper on 200 subjects including both males and females in the age group of 21 – 35 years. The data obtained was statistically analyzed using paired student t-test ( $\alpha=0.05$ ). **Results:** The golden proportion was found to exist only in 18.75% of the subjects when considering maxillary anterior teeth widths. The results revealed that golden proportion was inconsistent in terms of relative tooth width. Furthermore, the results revealed that golden percentage was rather constant in terms of relative tooth width. Central incisor represented 21%, lateral incisor 14% and canine 12% of the width of six maxillary anterior teeth, as viewed from the front. **Conclusion:** The golden proportion is an unsuitable method to relate the successive width of the maxillary anterior teeth in natural dentition. However, the golden percentage theory can be applied if percentages are adjusted, taking into consideration the ethnicity of the population of Aligarh.

**KEYWORDS:** Golden Percentage, Golden Proportion, Recurring Esthetic Dental.

### INTRODUCTION

When a human being smiles, the labial aspects of maxillary anterior teeth are more prominently visible; therefore they have a significant consequence in cosmetic dentistry. One of the chief and analytical jobs in aesthetic dentistry is creating a harmonious proportion when restoring or fabricating these teeth. During the treatment of dental patients, it is the responsibility of the dentist to determine the shape of the tooth and proportion in order to get desirable prognosis. The golden proportion is one of the geometric proportions that have been suggested as a guide to create pleasing anterior restorations. The golden proportion is a constant ratio between the larger and smaller length. The ratio is approximately 1.618:1.<sup>[1]</sup> In terms of proportion, the smaller tooth is about 62% the size of the larger one. For example when the ratio between a central and lateral incisor is in golden proportion, the central incisor is 0.618 larger or 62% more than the size of the lateral incisor.<sup>[2]</sup> This constant ratio has been used to determine the proportion of maxillary anterior teeth to achieve aesthetic results.

This specific relation is unique, perfect, ideal, and desirable. It has been used from studying beauty to design aesthetic restorations. 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. Snow considered a bilateral analysis of apparent individual tooth width as a percentage of the total apparent width of the six anterior teeth. He proposed the golden percentage, wherein the proportional width of each tooth should be: canine 10%, lateral 15%, central 25%, central 25%, lateral 15%, and canine 10% of the total distance across the anterior segment, in order to achieve an aesthetically pleasing smile.<sup>[3,4]</sup> The studies have shown both the presence and the disapproval of golden proportion. The uncertainty of golden proportion in aesthetic analysis and in smile design intended this study to evaluate the existence or presence of golden proportion in the population of Aligarh, U.P., India.

### MATERIALS AND METHODS

Two hundred North Indian subjects, 100 male and 100 female, with age ranging from 21- 35 years participated in this study. The selection criteria required the subjects

to have a North Indian origin with all their natural anterior teeth except for possibly the third molars, no history of orthodontic treatment, no tooth size alteration, rotation, spacing, crowding and restoration. Subjects not full filling the above mentioned criteria were not enrolled in this study. Entire procedure was made least complicated as the subjects for the study were evaluated in normal clinical situations rather than in complex environment. The digital vernier caliper was used to measure the widths of maxillary central, lateral and canine. The digital vernier caliper was used to measure the widths accurately and it modified using ball pins to get precise measurements. The widths of the maxillary incisors were measured at the mesio-distal contact points of teeth. The width of the canine was measured from the mesial contact point to the distal most point visible from the frontal view. Each measurement was made five times by the same dentist and the repetitive values were made to get accurate and precise results. 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 and canine was evaluated for golden proportion.<sup>[5,6]</sup> The measurements were recorded and statistically analyzed using Student's paired t-test at  $\alpha=0.05$

## RESULTS

The data which was obtained was recorded into Microsoft Excel 2010 worksheet 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. Alpha error was set at 5% and *P* value less than 0.05 was considered statistically significant. The data revealed no statistical significance in the ratio of golden proportions based on gender. The data obtained from this study is summarized in Table 1. The ratio of 1.2 and 1.3 were more common than 1.621 which was observed in 8% of the samples.

**Table1. Frequency and percentage of ratio in the study sample**

| Ratio | Male     | Females  | Total |
|-------|----------|----------|-------|
| 1.1   | 0 (0%)   | 0(0%)    | 0%    |
| 1.2   | 39 (39%) | 26 (26%) | 32.5% |
| 1.3   | 35 (35%) | 38 (38%) | 36.5% |
| 1.4   | 14 (14%) | 18 (18%) | 15%   |
| 1.5   | 8(8%)    | 8 (8%)   | 8%    |
| 1.6   | 4 (4%)   | 10 (10%) | 8%    |

Chi square value: 2.53 *P*=0.6 (Not significant)

## DISCUSSION

The golden proportion has been proposed in the literature as a useful application for achieving proportion and aesthetics. The golden proportion (1.618: 1.0) describes the ratio between the dimensions of a larger and a smaller length. Various researchers have opined for and against the use of this mathematic proportions in dentistry. Levin observed the golden proportion between the width of central incisor, lateral incisor and the canine.<sup>[7]</sup> Preston found 17% of his study samples had golden proportion between the width of the maxillary central and lateral incisors.<sup>[8]</sup> Lombardi recommended a repeated ratio concept in contrast to golden proportion.<sup>[9,10]</sup>

The results of the study indicated that golden proportion did not exist in majority of the North Indian population. The ratio of 1.2 and 1.3 were more commonly observed in 32.5% and 36.5% of individuals than 1.618. The ratio of 1.5 and 1.6 were found in 8% and 8% of the study group evaluated. The 1.2 ratio which was commonly observed is substantiated by Rosensteil et al. Javaheri and Shahnavaz, Jahanbin et al.,<sup>[11,12]</sup> Decker, Sarver and Ackerman, Marguardt, Howells and Shaw, Amoric, Phillips et al., Wolfart et al.<sup>[13,14]</sup> consider golden proportion to be a superior aspect of aesthetics 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 human are individuals with unique facial and dental features. Being one of the micro aesthetics factors of aesthetics it is not a major consideration whereas the other macro esthetic factors and principles play a significant role in determining esthetics.

The adherence to a particular proportion for all patients universally is impractical. The results of this study showed varied existence of specific ratio of 1.2 in 32.5% of study samples and 1.3 and 36.5% of samples. No major differences in proportion existed between the sexes. Findings of this study were substantiated by other investigations of de Castro et al.<sup>23</sup>, Ong et al.<sup>24</sup>, Wolfart et al., Shell and Woods done on non-Indian population.<sup>[15,16]</sup> The results of this study have inferred that golden proportion is not seen in majority of the population of Aligarh.

Though the width measurements were made to clinical precision there might be a 0.5 mm variation exist in the proximal contact area measurement which can be a binding limitation in this study. From the results obtained and within the limitations of the study the following were appraised. Ethnic differences should be considered for aesthetics and proportion studies. The golden proportion

was not found between maxillary anterior teeth in majority of Aligarh population and the ratio of 1.2 and 1.3 is more commonly seen in Aligarh population. There were no major changes seen in the proportions between sexes and symmetry of teeth in Aligarh population.

### CONCLUSION

In the light of the results of this investigation the following conclusions can be derived:

- 1) The theory of Golden percentage was more applicable to the subjects of this study.
- 2) The golden proportion was not found to exist between perceived maxillary anterior teeth on natural dentition.
- 3) In order to establish objectively quantifiable width ratio between maxillary anterior teeth, ethnic differences should be taken into consideration.

This will also help determine exactly what percentages are truly golden.

Thus golden proportion is an inappropriate method to relate the successive widths of the maxillary anterior teeth in North Indian population.

### REFERENCES

1. Lombardi RE. The principles of visual perception and their clinical application to denture esthetics. *J Prosthet Dent*, 1973; 29: 358-82.
2. Levin EL. Dental esthetics and the golden proportion. *J Prosthet Dent*, 1978; 40: 244-52.
3. Preston JD. The golden proportion revisited. *J Esthet Dent*, 1993; 5: 247-51.
4. Ward DH. Proportional smile design using the recurring aesthetic dental (RED) proportion. *Dent Clin North Am*, 2001; 45: 143-54.
5. Snow SR. Esthetic smile analysis of anterior tooth width: The golden percentage. *J Esthet Dent*, 1999; 11: 177-84.
6. Mashid M, Khoshvaghti A, Varshosaz M, Vallaei N. Evaluation of "Golden Proportion" in individuals with an esthetic smile. *J Esthet Restor Dent*, 2004; 16: 185-92.
7. Fayyad MA, Jaman KD, Aqrabawi J. Geometric and mathematical proportions and their relations to maxillary anterior teeth. *J Contemp Dent Pract*, 2006; 7: 1-10.
8. Preston JD. The golden proportion revisited. *J Esthet Dent*, 1993; 5: 247-251.
9. David M Sarver, Marc B Ackerman Dynamic smile visualization and quantification: Part 2 Smile analysis and treatment strategies. *Ortho Dentofacial Orthop* 2003; 124: 116-27.
10. Lombardi RE. The principles of visual perception and their clinical application to denture esthetics. *J Prosthet Dent*, 1973; 29: 358-382.
11. Murthy BV, Ramani N. Evaluation of natural smile: Golden proportion, RED or Golden percentage. *J Conserv Dent*, 2008; 11: 16-21.
12. Bukhary SM, Gill DS, Tredwin CJ, Moles DR. The influence of varying maxillary lateral incisor dimensions on perceived smile aesthetics. *Br Dent J.*, 2007; 203: 687-693.
13. Naveen Gopi C, Vaikunth Vijay K, Vedantham R. *J Adv Prosthodont*, 2012 May; 4(2): 72-75.
14. Mizumoto Y, Deguchi T Sr, Fong KW. Assessment of facial golden proportions among young Japanese women. *Am J Orthod Dentofacial Orthop*, 2009; 136: 168-174.
15. Ricketts RD, The biologic significance of the divine proportion and Fibonacci series. *Am J Orthod*, 1982; 81: 351-69.
16. Javaheri DS, Shahnavaz S. Utilizing the concept of the golden proportion *Dent Today*, 2002; 21: 96-101.