

## Anterior Maxillary Tooth Proportions and the Golden Percentage Concept in the Deutero-Malay Race (Study on Dental Students in the Faculty of Dentistry, Universitas Indonesia)

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### Abstract

The anterior maxillary tooth proportions are an important component of anesthetic smile. Harmonization of the face and the observed proportions affect the acceptability of a smile's esthetics. Many concepts have been proposed as guidelines for esthetic dental proportions, such as the golden proportion and the golden percentage. However, no study has yet investigated the proportions of the maxillary anterior tooth widths in the Deutero-Malay race, the largest population in Indonesia. The aim of this study was to evaluate the maxillary anterior tooth width proportions among students of Deutero-Malay origin in the Faculty of Dentistry, Universitas Indonesia (FKG UI) and to verify whether these proportions match the golden percentage. Methods: This descriptive study was conducted on 100 FKG UI students of Deutero-Malay origin. Subjects were queried regarding their satisfaction with the overall appearance of their smiles (harmonization of face, mouth, and teeth). Study models were made for all subjects from maxillary impressions. The outermost point of the maxillary anterior tooth width, from the frontal aspect, were projected onto millimeter-block paper and measured. The percentage was obtained by dividing the width of each anterior tooth by the total anterior tooth width and the data were then tabulated and analyzed statistically. As a results, the proportions of the maxillary anterior tooth widths were 12, 16, 22, 22, 16, and 12%. These proportions were considered esthetically satisfying to 97% of the study subjects. It was conclude that the maxillary anterior tooth widths among FKG UI students of Deutero-Malay origin showed a specific proportion that does not follow the golden percentage proposed in earlier studies on subjects of different origins. However, the observed proportion was considered esthetically satisfying by the study subjects.

*Clinical article (J Int Dent Med Res 2017; 10(Special Issue): pp.470-474)*

**Keywords:** Deutero-Malay, esthetics, golden percentage, maxillary anterior tooth proportion, perception of esthetics.

**Received date:** 14 August 2017

**Accept date:** 15 September 2017

### Introduction

The desire for an esthetically satisfying appearance is increasing in today's society. Consequently, many dental patients now seek treatment with a primary concern for esthetic enhancement of their oral condition, and especially their smiles.<sup>1,2</sup>

For this purpose, several components of a smile should be considered and evaluated,

including tooth proportion, color, and shape.<sup>1,3</sup>

One important aspect of smile design is tooth proportion,<sup>1,3</sup> as represented by the frontal view of the anterior maxillary teeth.<sup>3</sup> Some suggested concepts for determining this proportion have included the golden proportion and the golden percentage.<sup>4,5</sup> The golden proportion dictates that, for an esthetically pleasing smile, the proportion of the frontal widths of the maxillary anterior teeth should be 1.618 : 1.0 : 0.618 for the central incisor, lateral incisor, and canine, respectively.<sup>6</sup> However, the tooth proportions of the general population do not always match the numbers in the golden proportion<sup>7,8</sup>, and the decimals (1.618 : 1.0 :

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0.618) create some difficulty in applying this proportion<sup>2</sup>. Other studies have therefore sought to develop alternatives to the golden proportion; one of these alternatives is the golden percentage.<sup>2,4</sup>

The golden percentage concept holds that the proportion of the frontal widths of the maxillary anterior teeth in an esthetically pleasing smile should be 25% for the central incisor, 15% for the lateral incisor, and 10% for the canine.<sup>2</sup> Studies by Fayyad<sup>4</sup> and Murthy<sup>5</sup> showed that golden percentage can be applied to different populations by making some modifications in percentages according to racial differences. However, no study has yet verified whether the proportions of the maxillary anterior tooth widths in the Deutero-Malay population in Indonesia match the golden percentage.

### Objectives

The aim of this study was to evaluate the proportions of the maxillary anterior tooth widths among FKG UI students of Deutero-Malay origin and to verify whether this proportion matched the golden percentage. The subjects were also asked to describe their perceptions of the overall appearance of their faces, mouths, and teeth.

### Methods

This was a descriptive study involving 100 dental students from FKG UI, batch 2010–2013, consisting of 10 males and 90 females. The inclusion criteria were as follows: possession of a complete set of maxillary dentition, excluding the third molars; no anterior crowding or anterior spacing; anterior teeth with no restoration and morphological anomalies; no prior history of orthodontic treatment; and a background that included at least two generations of Deutero-Malay origin.

All subjects first completed an examination form (including identity) and provided written informed consent. The subjects then were asked whether they were satisfied with the overall appearance of their faces, mouths, and teeth. Maxillary study models were then made using an irreversible hydrocolloid (Aroma Fine Plus, GC, Tokyo, Japan) in a stock tray (ASA, Asa Dental, Italy), followed by casting using type 2 dental stone (Coecal, GC,

Tokyo, Japan). The outermost point of the maxillary anterior tooth width, from the frontal aspect, was projected onto millimeter-block paper (millimeter block, KNI, Indonesia) and measured (Figure 1).

The percentage was obtained by dividing the width of each anterior tooth by the total anterior tooth width. All data were tabulated and analyzed using the Statistical Software Package for Social Sciences (SPSS version 20).



**Figure 1.** The widths of the maxillary anterior teeth are projected onto the millimeter-blockpaper.

### Results

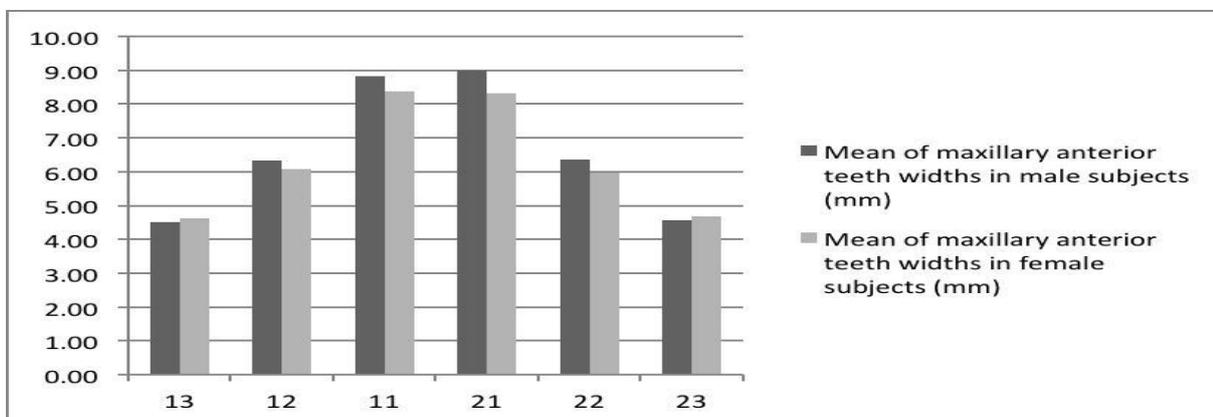
The measurement results shown in Table 1 indicate the presence of small differences in the widths of the maxillary left and right anterior teeth: 0.05 mm between teeth 13 and 23, 0.11 mm between teeth 12 and 22, and 0.04 mm between teeth 11 and 21. Overall, the maxillary anterior teeth were wider on the right side than on the left side.

Differences were also noted for the anterior tooth widths in male and female subjects, as males, in general, had a greater anterior tooth width when compared to females (Figure 2).

The mean proportions of the maxillary anterior tooth widths in this study were 12, 16, 22, 22, 16, and 12% for teeth 13, 12, 11, 21, 22, and 23, respectively (Table 2). This proportion does not match the numbers for the golden percentage, which purportedly yields the most esthetically pleasing smile. The maxillary anterior tooth proportions for the golden percentage should be 10, 15, 25, 25, 15, and 10% for teeth 13, 12, 11, 21, 22, and 23, respectively (Figure 3).

Tooth width	13 (mm)	12 (mm)	11 (mm)	21 (mm)	22 (mm)	23 (mm)	total (mm)
<b>Mean</b>	4.6240	6.1130	8.4310	8.3920	6.0000	4.6675	38.2275
<b>Standard Deviation</b>	0.5888	0.4541	0.5363	0.6894	0.5257	0.7007	1.7959
<b>Mean ± SD</b>	4.0352	5.6589	7.8947	7.7026	5.4743	3.9668	36.4316
	-	-	-	-	-	-	-
	5.2128	6.5671	8.9673	9.0814	6.5257	5.3682	40.0234
<b>Min value</b>	3.60	5.00	7.00	4.50	4.30	3.50	33.30
<b>Max value</b>	6.50	7.00	9.50	9.50	7.00	8.00	43.00

**Table 1.** Measurement of the widths of maxillary anterior teeth.



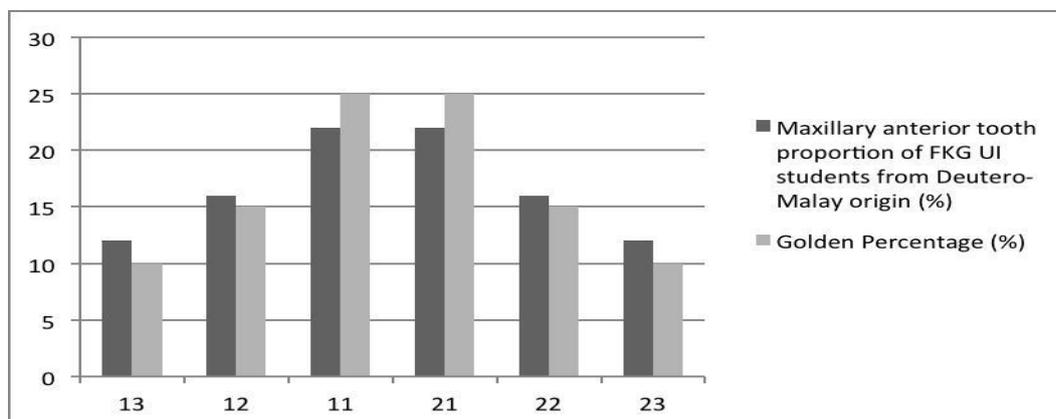
**Fig 2.** Mean widths of the maxillary anterior teeth in male and female subjects

The subjects were asked whether they were satisfied with the overall appearance of their faces, mouths, and teeth. The responses indicated that 97 of the 100 subjects were

satisfied with the overall appearance of their faces, mouths, and teeth (including their anterior tooth proportions).

Tooth width proportion	13 (%)	12 (%)	11 (%)	21 (%)	22 (%)	23 (%)
Mean	12.0845	15.9905	22.0670	22.0591	15.6909	12.1065
Standard Deviation	1.3182	0.9108	1.2221	1.3690	1.1079	1.3900
Mean ± SD	10.7663	15.0797	20.8449	20.6901	14.5830	10.7165
	-	-	-	-	-	-
	13.4027	16.9103	23.2891	23.4281	16.7988	13.4965
Smallest value	10.00	13.16	18.99	18.18	12.16	8.97
Largest value	15.48	18.92	25.00	25.57	18.18	16.46

**Table 2.** Maxillary anterior tooth proportion of the subjects.



**Figure 3.** Maxillary anterior tooth proportions for FKG UI students of Deutero-Malay origin compared with the golden percentage concept

### Discussion

The proportions of the maxillary anterior tooth widths measured in the subjects of this study did not match the numbers proposed by Snow<sup>2</sup> for the golden percentage. Only the proportions of tooth 12 and tooth 22 can be regarded as matching the golden percentage. The width proportion of tooth 12 in this study ranged from 15.0097 to 16.9013% and that of tooth 22 ranged from 14.5830 to 16.7988%.

Similar results were found in other studies by Fayyad<sup>4</sup>, Murthy<sup>5</sup>, and Rita.<sup>6</sup> The findings of the present study support the previous conclusions that racial differences in a population should be considered when seeking to apply the concept of the golden percentage.<sup>4,5,6</sup> The maxillary anterior tooth proportions in a population vary according to racial differences, so the anterior tooth

proportions of the golden percentage should be adjusted according to these differences. Some studies<sup>9,10,11</sup> have reported different, but constant, percentages for the anterior tooth proportions in different races. In the present study, the proportions of the anterior tooth widths for FKG UI students of Deutero-Malay origin did not match the golden percentage suggested by Snow.

The subjects in the present study were asked whether they were satisfied with the overall appearance of their faces, mouths, and teeth. The responses to this question confirmed that 97 subjects were satisfied with the overall appearance of their faces, mouths, and teeth (including their anterior tooth proportions). This result suggested that even though the maxillary anterior tooth proportions of these subjects did not follow the golden percentage, most subjects still regarded their proportions as esthetically satisfying.

A minority of subjects did not feel satisfied with the overall appearance of their faces, mouths, and teeth (including their anterior tooth proportions), despite having mean maxillary anterior tooth proportions of 13, 16, 21, 22, 16, and 13%. This finding suggested that a small number of subjects might be dissatisfied with their tooth proportions, even though those proportions were considered esthetically ideal by most subjects.

The limitation of this study is the small number of subjects, which was not large enough to represent the entire Deutero-Malay race in Indonesia

## Conclusion

The widths of maxillary anterior teeth among FKG UI students of Deutero-Malay origin showed a specific proportion that does not follow the golden percentage. However, this proportion, in general, was esthetically satisfying, according to most of the study subjects. Therefore, the percentages found in this study could be useful as a guideline for esthetic dental proportions among patients of Deutero-Malay origin. Nevertheless, the patient's perception about esthetics should always be considered.

## Acknowledgement

The publication of this manuscript is supported by Universitas Indonesia.

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