



Evaluation of the golden proportion and golden standard of maxillary anterior teeth in relation to smile attractiveness

Avaliação da proporção áurea e padrão-ouro dos dentes anteriores superiores em relação à atratividade do sorriso

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ABSTRACT

Objective: The present study aimed to explore the existence of golden proportion (GP) between the widths of maxillary anterior teeth and golden standard (GS) for width to height ratio of maxillary central incisor in individuals with attractive and non-attractive smiles. **Material and Methods:** A total 82 females were recruited and divided into 2 groups: attractive smile (n=41) and non-attractive smile (n=41). Frontal photographs were taken, scanned, and saved in a personal computer. The apparent mesiodistal width of each anterior tooth was measured. The data were analyzed using the appropriate statistical tests at a P-value of <0.05. **Results:** Frequency of GP was very low among the total sample, and most proportions were higher than GP. No significant differences were found between both groups in relation to central-to-lateral ratio while, significant differences were found in relation to canine-to-lateral ratio. Similarly, most proportions of width to height ratio were higher than GS. Differences between groups were significant for the left side and for both sides (P<0.05) but was not for the right side (P>0.05). **Conclusion:** Frequency of the golden proportion was very low among the study population. Smile attractiveness was not greatly related to the proportions between the teeth.

KEYWORDS

Golden proportion; Golden standard; Attractive smile; Esthetic; Anterior teeth.

RESUMO

Objetivo: O presente estudo teve como objetivo explorar a existência de proporção áurea (GP) entre as larguras dos dentes anteriores superiores e padrão-ouro (GS) para a relação largura-altura do incisivo central superior em indivíduos com sorrisos atraentes e não atraentes. **Material e Métodos:** Foram recrutadas 82 mulheres, divididas em 2 grupos: sorriso atraente (n = 41) e sorriso não atraente (n = 41). Fotografias frontais foram tiradas, digitalizadas e salvas em um computador pessoal. A largura aparente mesiodistal de cada dente anterior foi medida. Os dados foram analisados por meio dos testes estatísticos apropriados, com valor de p<0,05. **Resultados:** A frequência de GP foi muito baixa entre a amostra total, e a maioria das proporções foi maior que a GP. Não foram encontradas diferenças significativas entre os dois grupos em relação à proporção centro-lateral, enquanto diferenças significativas foram encontradas em relação à proporção canino-lateral. Da mesma forma, a maioria das proporções de relação largura / altura foi maior que GS. As diferenças entre os grupos foram significativas para o lado esquerdo e para ambos os lados (P<0,05), mas não para o lado direito (P> 0,05). **Conclusão:** A frequência da proporção áurea foi muito baixa na população estudada. Atratividade de sorriso não foi fortemente relacionada com as proporções entre os dentes.

PALAVRAS-CHAVE

Proporção áurea; Padrão-ouro; Sorriso atraente; Estética; Dentes anteriores.

INTRODUCTION

Study of the face started thousands of years ago. Clinicians, artists, and sculptors are more interested in the face form and its features. The ability to modify the face form requires thorough understanding of the facial beauty/esthetics and proportions/symmetry of the face. Several guidelines have been proposed to describe the symmetry and typical proportions of the face. For a long time, golden proportions (GP) have been widely used for the ideal human face [1]. The golden proportion was described geometrically in the 4th century BC by Euclid as: if we have 2 lines (AC and CB) in such a way that $AB:AC=AC:CB$. The golden proportion was then defined as phi, and was found to be equal to 1.618 (≈ 1.62). Surprisingly, it has been found to be often associated with esthetics and harmony in many fields in nature such as mathematics, geometry, morphology of flowers, sea shells, mammals, and the human body and face [2-4]. Golden ratios for anterior teeth was mentioned for the first time by Lombardi [5].

Mathematical analysis of the ideal face was proposed for the first time by Ricketts. He also suggested the use of the golden proportion for this purpose [6,7]. While smiling, it is clearly visible that the widths of maxillary anterior teeth decrease eventually toward distal; that means they become smaller, especially laterals and canines, including their actual widths because of the curvature of the dental arch [8]. The golden ratio or proportion suggests that the visible width of the upper canine is 62% of the upper lateral width which is also 62% of the upper central width. In other words, if the width of the upper lateral incisor is equal to 1, the width of the canine will be 62% of the lateral width and the width of the central incisor will be 1.62% of the lateral width. Harmony of the smile is as important as harmony of the face [3,6,9,10]. An esthetically accepted or pleasing smile has symmetrical harmony

across the midline [11]. In addition to the golden proportion, there is another ratio suggested in this aspect which is related to the percentage between height and width of the upper central incisor. Dental literature has many studies that define a ratio of 0.80 as a golden standard (GS) for the height/width of the upper central incisor [12,13]. Both proportions have been widely used in restorative dentistry, periodontics, orthodontics, and prosthodontics to restore, replace or move the teeth for accepted shape, size, or alignment [14-16].

Considering the current debate regarding the applicability of golden proportions, the present study aimed to evaluate the occurrence of the golden proportion between the perceived widths of maxillary anterior teeth in a sample of adult Sudanese women. In addition, it investigated whether consistent relationships exist between the maxillary central width and height of the clinical crown dimensions. No published study has been carried out for the Sudanese population. Therefore, the present study will be of great help in exploring these proportions which, in turn, will be useful in daily dental practice.

MATERIAL AND METHODS

This present study was a cross-sectional comparative study conducted between March and December 2017. All female dental students were invited to participate in the study. A total of 350 students agreed to take part in the study. They were examined and subjected to inclusion and exclusion criteria (Table 1). Out of those, only 154 met inclusion criteria. Frontal photographs were taken (Nikon D3100/ 14.1 Megapixel) with a posed smile in the natural head position (a standardized and reproducible orientation of the head when the subject is focusing on a distant point at eye level and the visual axis is therefore horizontal) [17,18]. Light and distance were kept constant and the upper lip was retracted

to clearly display the maxillary anterior teeth as well as their respective gingiva. [19] For final sample selection, all photographs were evaluated for attractiveness by a panel comprised of an orthodontist, an oral and maxillofacial surgeon, a prosthodontist and a professional photographer. The photographs were presented for the panel members and each photograph was evaluated with a score from 1 to 10. The first three scores (1-3) mean that the smile is not attractive (Figure 1). Scores from 4 to 6 mean the smile is fair (Figure 2). The last scores (7-10) mean that the smile is attractive (Figure 3). For different evaluation scores, the mean was obtained and rounded to 0 decimal. Out of the 154 included students, only 41 had a 7-10 score (attractive smile), 73 had a 4-6 score (fair smile), and 41 had a 1-3 score (non-attractive smile). The first and third groups were selected for further procedures in the study. All photographs were digitalized and the maximum width of the central, lateral and canine were measured from the mesial and distal contact points of any single tooth on a line perpendicular to the long axis (Figure 1). The longest distance from the cervical margin to the incisal edge of the central incisor was recorded as the height on a line parallel to the long axis [19].

All data were entered into SPSS program (version 21) and descriptive statistics were used to describe data in terms of frequencies, means and standard deviations. The central incisor width to height ratios were calculated and compared to the 75-80% ratio which was proposed as the most esthetically pleasing. [20,21] The data obtained were tabulated and subjected to statistical analysis using an unpaired t-test. This was followed by qualitative analysis to verify the percentage of values falling in the specific range. For all tests, a P-value was set at 0.05. Signed informed consents were obtained from students before enrolment in the study and an ethical approval letter was obtained from the ethical committee review board (Ref: 1403/2017).



Figure 1 - Individual with non-attractive smile.



Figure 2 - Individual with a fair smile.



Figure 3 - Individual with an attractive smile.

Reliability test

To test the intra-examiner reliability of measurements, 20 photographs of the total sample (82) were randomly selected and measured. They were re-measured by the same examiner after two weeks. T-test was conducted as well as the intra class correlation coefficient (ICC) test between the two measurements at $p < 0.05$ [22]. The

ICC for all measurements was 0.88 (95% CI: 0.78 to 0.95) with high significant level ($p = 0.000$). It was 0.96 for the left central incisor height ($p = 0.000$), 0.92 for the left central incisor width ($p = 0.000$), 0.90 for the left lateral width ($p = 0.000$), and 0.69 for the left canine width ($p = 0.007$). More details about the ICC test and the confidence interval of the measurements are presented in Table 2. The casual error of method was calculated using the Dahlberg formula: $ME = \sqrt{\sum d^2 / 2n}$. Where: ME, method error; d, differences between the first and second measurement, and n, sample of repeated measurements. The results revealed small measurement errors between the two readings (Table 2).

Table 1 - inclusion and exclusion criteria used in the selection of study sample

Inclusion criteria	Exclusion criteria
1. Sudanese Nationality.	1. Class II or Class III incisors malocclusions.
2. Present maxillary and mandibular anterior teeth.	2. History of previous orthodontic treatment.
3. No periodontal problem, good oral hygiene.	3. Students with dental trauma in the maxillary anterior teeth.
4. No spacing and crowding in maxillary anterior teeth.	4. Students with missing anterior teeth.
5. No history of orthodontic treatments.	5. Students have crown, bridge or, caries in anterior segment.
6. No intruded, extruded or rotated teeth in the anterior region.	
7. No deformities or any disease that may affect the tooth morphology	

Table 2 - Intraclass Correlation Coefficient and measurement error

	ICC	95% CI		p	ME (Dahlberg formula)
		Lower Bound	Upper Bound		
ALL measurements	0.88	0.78	0.95	< 0.001	
Central height	0.96	0.89	0.98	< 0.001	0.045
Central width	0.92	0.80	0.97	< 0.001	0.041
Lateral width	0.90	0.75	0.96	< 0.001	0.037
Canine width	0.69	0.23	0.88	0.007	0.043

ICC: Intraclass Correlation Coefficient; CI: Confidence Interval; ME: Measurement Error

RESULTS

The top 5 frequent proportions for the whole, attractive, and non-attractive samples are presented in Table 3. The table also shows proportions for the left and right sides as well as for the average of both sides. It can be seen that the most frequent proportions of the average of both sides for the whole sample was 1.64 for the central-to-lateral ratio (7.3%) and 0.63 for the canine-to-lateral ratio (9.8%). It was 1.63 for the central-to-lateral ratio (11%) and 0.63 for the central-to-lateral ratio (13.4%) for the attractive group. However, it was 1.43 for the central-to-lateral ratio (6.1%) and 0.83 for the canine-to-lateral ratio (6.1%) for non-attractive group. For the left central-to-lateral ratio it was 1.67 for whole sample (6.1%), 1.67 (12.2%) for attractive group, and 1.43 (7.3%) for non-attractive group. Left canine-to-lateral ratio revealed ratio of 0.63 (9.8%) for the whole sample, 0.63 (17.1%) for the attractive group, and 0.82 (9.8%) for non-attractive group. For right side, the ratio was 1.63 (11%) for the whole sample, 1.63 (19.5%) for the attractive group, and 1.43 (4.9%) for the non-attractive group. Canine-to-lateral ratio of the right side was 0.60 (7.3%) for the whole sample, 0.60 (14.6%) for the attractive group, and 0.83 (9.8%) for the non-attractive group.

Table 3 - Top 5 most frequent proportions for Central-to-lateral and Canine-to-lateral among all sample and attractive and non-attractive

	ALL sample				Attractive group				Non-attractive group			
	Central-to-lateral		Canine-to-lateral		Central-to-lateral		Canine-to-lateral		Central-to-lateral		Canine-to-lateral	
	Ratio	Frequency	Ratio	Frequency	Ratio	Frequency	Ratio	Frequency	Ratio	Frequency	Ratio	Frequency
Both sides	1.64	73	.63	9.8	1.63	11.0	.63	13.4	1.43	6.1	.83	6.1
	1.60	6.1	.62	7.3	1.64	9.8	.64	11.0	1.42	3.7	.78	4.9
	1.63	6.1	.64	7.3	1.67	8.5	.62	9.8	1.62	3.7	.82	4.9
	1.47	3.7	.61	6.1	1.60	4.9	.67	8.5	1.73	3.7	.85	4.9
	1.59	3.7	.76	6.1	1.68	4.9	.60	7.3	1.31	2.4	.51	3.7
Left	1.67	6.1	.63	9.8	1.67	12.2	.63	17.1	1.43	7.3	.82	9.8
	1.58	4.9	.64	6.1	1.64	9.8	.62	9.8	1.73	7.3	.78	7.3
	1.64	4.9	.69	6.1	1.61	7.3	.64	9.8	1.31	4.9	.81	7.3
	1.73	4.9	.82	6.1	1.69	7.3	.67	9.8	1.42	4.9	.87	7.3
	1.42	3.7	.62	4.9	1.46	4.9	.69	9.8	1.48	4.9	.59	4.9
Right	1.63	11.0	.60	7.3	1.63	19.5	.60	14.6	1.43	4.9	.83	9.8
	1.64	4.9	.61	6.1	1.64	9.8	.61	12.2	1.57	4.9	.51	7.3
	1.43	3.7	.63	6.1	1.56	4.9	.64	12.2	1.72	4.9	.97	7.3
	1.57	3.7	.64	6.1	1.59	4.9	.62	9.8	2.03	4.9	.74	4.9
	1.51	2.4	.62	4.9	1.60	4.9	.63	9.8	2.67	4.9	.85	4.9

Test of differences between attractive and non-attractive groups revealed highly significant differences ($p < 0.001$) for the canine-to-lateral ratio either for the left and right sides or the average of both sides. No significant differences, however, were seen regarding the central-to-lateral ratio (Table 4). Group differences revealed significant difference ($p = 0.020$) between the left and right central-to-lateral GP for the non-attractive group. Another significant difference

between the left and right canine-to-lateral GP for attractive group ($p = 0.001$) (Table 5). Most proportions in the attractive group fell within the range of 1.55-1.64 for the central-to-lateral ratio and within the range of 0.55-0.64 for the canine-to-lateral ratio while, low percentage of proportions were within the range of 1.60-1.63 and the range of 0.60-0.63. However, very low percentages were found in relation to the golden proportions (GP) 1.62 and 0.62 (Table 6).

Table 4 - Differences between attractive and non-attractive groups in relation to left, right, and both sides

Side	Ratio	Group	Mean (SD)	Mean Difference	95% CI		p
					Lower	Upper	
Left	Central-to-lateral	Non-attractive	1.66 (0.33)	0.03	-0.07	0.14	0.498
		Attractive	1.63 (0.10)				
	Canine-to-lateral	Non-attractive	0.78 (0.12)	0.12	0.07	0.17	
		Attractive	0.66 (0.09)				
Right	Central-to-lateral	Non-attractive	1.84 (0.41)	0.16	0.02	0.29	0.083
		Attractive	1.68 (0.14)				
	Canine-to-lateral	Non-attractive	0.73 (0.16)	0.12	0.07	0.17	
		Attractive	0.61 (0.05)				
Both sides	Central-to-lateral	Non-attractive	1.72 (0.29)	0.08	-0.02	0.17	0.265
		Attractive	1.65 (0.09)				
	Canine-to-lateral	Non-attractive	0.76 (0.12)	0.12	0.08	0.16	
		Attractive	0.64 (0.05)				

Table 5 - Differences between left and right sides among attractive and non-attractive groups

Group	Ratio	Side	Mean (SD)	Mean Difference	95% CI		p
					Lower	Upper	
None attractive	Central-to-lateral ratio	Left	1.66 (0.33)	-0.18	-0.34	-0.01	0.020
		Right	1.84 (0.41)				
	Canine-to-lateral ratio	Left	0.78 (0.12)	0.04	-0.02	0.10	
		Right	0.73 (0.16)				
Attractive	Central-to-lateral ratio	Left	1.63 (0.10)	-0.05	-0.11	0.00	0.307
		Right	1.68 (0.14)				
	Canine-to-lateral	Left	0.66 (0.09)	0.04	0.01	0.08	
		Right	0.61 (0.05)				

Table 6 - Frequency of proportions for all sample and attractive and non-attractive groups

Sample	Side	Central-to-lateral		
		Range 1.55-1.64	Range 1.60-1.63	GP (1.62)
All Sample	Both sides	32.9%	15.9%	2.4%
	Left	25.6%	9.8%	2.4%
	Right	29.3%	15.9%	2.4%
Attractive	Both sides	43.9%	20.7%	12%
	Left	39.0%	14.6%	∕
	Right	48.8%	26.8%	2.4%
Non-attractive	Both sides	11.0%	12.0%	3.7%
	Left	12.2%	4.90%	4.9%
	Right	9.8%	4.80%	2.4%
Sample	Side	Canine-to-lateral		
		Range 0.55-0.64	Range 0.60-0.63	GP (0.62)
All Sample	Both sides	41.5%	25.6%	7.3%
	Left	29.3%	14.6%	4.9%
	Right	41.5%	24.4%	4.9%
Attractive	Both sides	63.4%	36.6%	9.8%
	Left	48.8%	26.8%	9.8%
	Right	78.0%	46.3%	9.8%
Non-attractive	Both sides	7.3%	2.4%	∕
	Left	9.8%	2.4%	∕
	Right	4.9%	2.4%	∕

As presented in Table 7, the most frequent width to height ratio of the whole sample was 0.85 for the left side (13.4%), 0.81 and 0.87 with equal frequency for the right side (11%), and 0.81 for the average of both sides (11%). For the attractive group, the width to height ratio was 0.85 for the left side (14.6%), 0.81 for the right side (17.1%), and 0.81 for the average of both sides (14.6%). For non-attractive group the most frequent width to height ratio was 0.85 for left side (12.2%), 0.79 and 0.87 with equal

frequency for right side (12.2%), and 0.85 for the average of both sides (9.8%). Significant differences were found between attractive and non-attractive groups in relation to the width to height ratio of the left side ($p=0.033$) and the width to height ratio of the average of both sides ($p=0.030$) while, no significant difference was found in relation to the right side ($p=0.060$) (Table 8). Differences within groups between the left and right sides also revealed no significant differences ($p>0.05$) (Table 9).

Table 7 - Top 5 most frequent proportions of width to height ratio for left, right, and both sides

Side	ALL sample		Attractive group		Non attractive group	
	Ratio	Frequency	Ratio	Frequency	Ratio	Frequency
Both sides	.81	11.0	.81	14.6	.85	9.8
	.84	9.8	.82	9.8	.87	8.5
	.90	8.5	.83	8.5	.79	6.1
	.83	7.3	.85	8.5	.86	6.1
	.86	7.3	.78	7.3	.82	4.9
Left	.85	13.4	.85	14.6	.85	12.2
	.81	7.3	.81	12.2	.86	7.3
	.88	7.3	.82	9.8	.88	7.3
	.82	6.1	.83	7.3	.89	7.3
	.86	6.1	.88	7.3	.99	7.3
Right	.81	11.0	.81	17.1	.79	12.2
	.87	11.0	.78	9.8	.87	12.2
	.82	8.5	.82	9.8	.82	7.3
	.79	7.3	.83	9.8	.85	7.3
	.83	7.3	.87	9.8	.91	7.3

Table 8 - Differences between attractive and non-attractive groups in relation to left, right, and both sides for width to height ratio

Side	Smile group	Mean (SD)	Mean Difference	95% CI		p
				Lower	Upper	
Left	Non-attractive	0.87 (0.09)	0.03	0.00	0.06	0.033
	Attractive	0.83 (0.05)				
Right	Non-attractive	0.86 (0.08)	0.03	0.00	0.06	0.060
	Attractive	0.83 (0.04)				
Both sides	Non-attractive	0.86 (0.08)	0.03	0.00	0.06	0.030
	Attractive	0.83 (0.04)				

Table 9 - Differences between left and right sides among attractive and non-attractive groups for width to height ratio

Side	Smile group	Mean (SD)	Mean Difference	95% CI		p
				Lower	Upper	
None attractive	Left	0.87 (0.09)	0.01	-0.03	0.05	0.581
	Right	0.86 (0.08)				
Attractive	Left	0.83 (0.05)	0.00	-0.02	0.02	0.692
	Right	0.83 (0.04)				

DISCUSSION

The golden proportion is a numerical concept that can be used by the dentist or laboratory technician to help design single or multiple dental restoration, set up a removable denture or to orthodontically move teeth into a more pleasing esthetic arrangement [23]. It should be considered in context with other metrics such as width-to-length and width-to-width ratios of the individual teeth and non-numeric considerations such as occlusion and lip position. In the present study, we sought to answer several questions regarding the golden proportion of the width-to-width ratio among maxillary anterior teeth (central, lateral, canine) and the golden standard among central incisors in attractive (n=41) and non-attractive (n=41) smiles. The results of the current study revealed a low occurrence of the golden ratio in the attractive and non-attractive smile groups. However, no significant difference between both groups was found. This result is similar to the results of some previous studies conducted in India [14,19,24-28], Iran [29-31], Pakistan [32-34], Malaysia [35], Jordan [36], Brazil [37], Romania [38], Nepal [39], China [40], Korea [41], Hungary [42], and in Irish, Iraqi, and Kurdish samples for the canine to lateral ratio [43,44]. However, our results contrast other studies conducted among other Indian [45] and Pakistani [46] samples, which found the golden ratio suitable for esthetic appearance. Also, studies conducted by Condon et al. [43] and Al-kaisy et al. [44] found that the golden ratio existed for the central to lateral ratio among Irish and Iraqi and Kurdish samples, respectively.

In the current study, most proportions were within the range of 1.55 to 1.64 and 0.55 to 0.64 for the central-to-lateral and canine-to-lateral, respectively. These results are in accordance with that of Mahshid et al. [30] in Iranian sample. Moreover, the golden proportion of 1.62 and 0.62 were very low in our sample with more frequent GP of 1.62 in the non-attractive group for the central-to-lateral ratio than that in the attractive group while, GP of 0.62 was more frequent for the canine-to-lateral ration in the

attractive group than that in the non-attractive group. This clearly shows the inapplicability of the golden proportions in Sudanese women with or without attractive smiles. Peixoto et al. [47] reported the ideal height to width ratio of the centrals should lie between 75% - 80%. However, the range of an esthetically acceptable appearance in the current study falls between 65% and 85%. The results showed height to width ratios higher than other studies 48, and similar to Al-Kaisy et al. [44] Ali Fayyad et al. [36] in Jordan and Hasanreisoglu in Turkey [49] reached proportion of 1.53:1:0.80 and concluded to not use the golden ratio in the esthetic treatment of the maxillary anterior teeth. In contrast, the central-to-lateral golden ratio was found in 50.3% and 38.1% among Iranian subjects [29] with and without attractive smiles, respectively, with significant differences. The canine-to-lateral ratio, however, was found low with no significant difference between the attractive and non-attractive groups. The authors of this study concluded that the golden proportion is partially valid for the central-to-lateral ratio but not for the canine-to-lateral ratio. In a Brazilian sample [47] with missing lateral replaced with an implant or canine repositioning, the golden ratio was not followed and the esthetic appearance was accepted and pleasant. It was suggested that the golden ratio in the maxillary anterior teeth is questionable and even not recommended.

Despite the different methodologies and/or different instruments used in these previous studies, most results were similar. All these findings support the current debate about the validity of the golden proportion as a guideline factor for a pleasant smile when dealing with the esthetic zone. Some variation may also be related to numerous factors which influence the beautiful smile similar such as the dentofacial specificities, cultural considerations, racial background, individual's own perception, and the different characteristics of the study sample in each country. Distinguishing between attractive and non-attractive smiles is an essential issue in dental practice. However, it should not be

determined only by dental practitioners, rather, patient approval and opinion should also be taken into consideration. For some specific cases, the co-patient's opinion may also be taken into consideration when designing or selecting the anterior teeth. This because of the presence of considerable differences between the layperson's and professional's perception of esthetics [50,51]. No significant difference was found in present study between the both non-attractive and attractive groups in relation to the golden standard of the width to height ratio of the central incisors. Al-Marzok et al. [35] found a significant difference between the golden standard of the width to height ratio of the central incisor and the recorded measurements. These findings suggest that the attractiveness of the smile and pleasant appearance is not related that much to the proportions between the teeth. Rather, it is a multi-factorial issue and can be affected by different complicated factors. It has been suggested that the golden ratio can be effectively used for long teeth but not for short teeth or teeth with normal view [52,53].

Some limitations of the present study should be mentioned, male gender wasn't taken into consideration. The measurements were performed only on the photographs without measurements on the casts or directly on the subject's mouth, and the small sample size which makes the generalization of the results questionable. However, the assessment of differences between subjects with attractive and non-attractive smiles is considered a point of strength for the present study. Taking the results of present study and previous findings into consideration, further studies should investigate a larger number of patients in multiple populations and different methods of analysis so that the application of esthetic proportions in the treatment planning of patients with missing teeth or disproportions could be used and allowed for generalizations.

CONCLUSION

Within the limitation of the present study the following conclusions can be drawn:

- The frequency of the golden proportion was very low among the study populations
- Most proportions in the attractive group fell within the range of 1.55-1.64 for the central-to-lateral ratio and the range of 0.55-0.64 for the canine-to-lateral ratio.
- Golden standards of width to height ratio of the central incisors were found most frequent within the range of 0.80-0.85.
- Attractiveness of the smile and pleasant appearance is not related that much to the proportions between the teeth. Esthetic is a self-perception issue rather than being mathematically calculated.

Competing interests

The authors declare that they have no competing interests.

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