

EVALUATION OF RECURRING ESTHETIC DENTAL PROPORTION IN NATURAL SMILE OF PAKISTANI SAMPLE

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ABSTRACT

It has always been argued as to what constitutes good dental esthetics, as it can vary from person to person depending on personal experiences and social ambiance. Recurring esthetic dental proportion has been stated to be an essential tool for achieving esthetics and harmony in smile. The objective of this study was to determine the prevalence of recurring esthetic dental proportion in maxillary anterior teeth widths in a selected sample of Pakistani population.

Two hundred dental students were included in the study, included 84 male subjects and 116 female subjects with the age range of 18 to 30 years. Photographs of the subjects were taken using a digital camera (Casio Exilim; EX-S5. Casio computer Corp, China. 10.1 megapixels with 100- mm macro lens and a point flash) and analyzed using Adobe Photoshop 7 software. The width of maxillary central incisors, lateral incisors and canines were found out using the measuring tool provided in the software. The Data were subjected to statistical analysis, (descriptive statistics and t-test, level of significance was set at $P < 0.05$).

The values of the recurring esthetic dental proportion (RED) were not constant in this study, and the farther the one moves distally from the midline the higher the values. The RED proportion theory can be applied to relate the successive widths of the maxillary anterior teeth if percentages are adjusted taking into consideration the ethnicity of the population, within the confines of this study. Recurring esthetic dental proportion was not seen in the widths of natural maxillary anterior teeth.

Key Words: Recurring Esthetic Dental Proportion, Esthetics, Maxillary anterior teeth.

INTRODUCTION

In the modern day's practice of dentistry, it is no longer acceptable to just repair individual teeth increasingly more patients are demanding a final appearance that is not only physiologically and mechanically sound but also esthetically pleasing.¹ One of the critical aspects of dental esthetics is creating precise dental proportion to relate the successive width of anterior teeth.² The Golden proportion, golden percentage and recurring esthetic dental are theories introduced so far in this regard.³ Several authors have presented guidelines regarding anterior teeth proportion in order to achieve excellent aesthetics.^{2,4,5} Lombardi⁶ was the first to suggest the application of the golden propor-

tion in dentistry. He proposed that dental and facial aesthetics are optimized if central incisor-to-lateral incisor width and lateral incisor-to-canine width are in repeated ratios when a person is viewed from the front.⁶ This proportion was called golden proportion and is approximately 1.618 to 1. In this manner the visible width of maxillary lateral incisor is 62% of central incisor and the visible width of canine is 62% of lateral incisor. Levin⁷ suggested the use of Golden proportion to relate the successive width of anterior teeth; he said that the width of upper 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. 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.⁷ Preston⁸ studied the relationship of golden proportion to the perspective dimension of maxillary dentition anteroposteriorly. He found only 17% of the samples studied actually had a golden proportion between the perceived width of the maxillary central and lateral incisors. Hasanreisoglu

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et al⁹ evaluated the dimensions of anterior teeth, the occurrence of golden proportion and several dental and facial measurements using full-face and anterior teeth images and gypsum casts of the maxillary arches of 100 Turkish dental students. The results showed that the dimensions of the central incisors and canines varied by gender; the existence of golden proportion was not substantiated. The studies around the globe have shown both the presence and the disapproval of golden proportion. Recently Ward¹⁰ suggested the recurring esthetic dental (RED) proportion. He based his suggestion on the result of his study in which he described RED proportion as the proportion of the successive width of the teeth remaining constant, when progressing distally from the midline. Seventy-five percent of north American dentists preferred using the RED proportion when designing smiles with normal-length teeth over using the golden proportion, this was suggested in another study in 2007 by Ward.¹¹ Keeping his point of view in mind this study was conducted in a sub set from Pakistani population. This was the first research done in Pakistan, as we found no similar research in Pakistan. The purpose of this study was to determine the prevalence of Recurring esthetic dental proportion in maxillary anterior teeth widths in a selected sample of Pakistani population.

METHODOLOGY

The study was conducted in Dental section/Dow University of Health Sciences, Karachi, Pakistan. The sample size for this study consisted of 200 dental students ranging in age from 18 to 30 years. A random population of acceptable esthetics was selected. The selection criteria required the subjects to have all of their natural anterior teeth, no periodontal disease, no spacing and crowding in anterior maxillary teeth, no history of orthodontic treatment, no intruded, extruded or rotated teeth in the anterior region and be of Pakistani origin.

A digital camera (Casio Exilim; EX-S5) was used to take front side anterior teeth images with the individual in a seated position. The camera was mounted on a tripod at 12 O'clock. The lip of participant was retracted in all photographs to enhance the visible of teeth.

The dental images obtained were processed in (Adobe Photoshop version 07; adobe Photoshop systems California) the mesiodistal width of each maxillary anterior tooth from labial surface was measured using measuring tool of this software and recorded in computer spread sheet.

Recurring esthetic dental proportion was calculated by dividing the width of each lateral incisor by the width of the adjacent central incisor and the resulting number was multiplied by 100. Similarly, the width of each canine was divided by the width of adjacent lateral incisor and the resulting number was multiplied

by 100. If the values obtained are constant, it means that the central incisor, lateral incisor, and canine are in RED proportion. The dental images of all subjects were made by the same operator. Fifteen of the images were remeasured under the same conditions by another researcher to establish the reliability of the measurements. The Test Re Test examination showed a correlation of 0.98 for the measurements.

The collected data were analyzed through Statistical package for social science software (Version 17.0; Chicago, Illinois, USA). Descriptive analysis of continuous and categorical variable was performed. Quantitative variable like age was calculated for mean and standard deviation. Mean and percentage was calculated of qualitative variable like gender and Recurring esthetic dental proportion. The mean values of men and women were compared using paired t- test (P-value <0.05 was considered as significant).

RESULTS

In this research 116 females and 84 males, with age range of 18-30 years (Table 2, Fig 1), were assessed. The average age of students were 22.05 ± 2.62 (mean $\pm$ SD). More than half of the subjects were greater than 24 years old. The RED proportion was investigated in the perceived maxillary anterior teeth widths. The widths of maxillary anterior teeth are summarized in (Table 1). The mean values and standard deviation for RED proportions of males and females subjects are listed in (Table 3). The values show that RED proportion is not constant when progressing distally in the maxillary arch from midline as suggested by Ward.¹⁰

According to the paired-sample t-test result the data collected from the 200 subjects revealed statistically significant difference between RED proportion values of the right lateral and central incisor in males and females ($p=0.05$) while there was no statistically

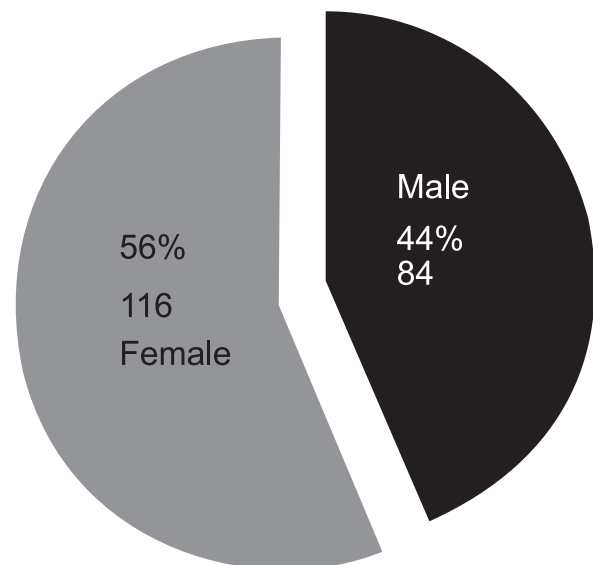


Fig 1: Gender distribution

TABLE 1: DESCRIPTIVE STATISTICS

	N	Minimum	Maximum	Mean	Std. Deviation
WRCI	200	6.20	10.00	8.00	0.61
WRLI	200	4.20	8.90	6.10	0.84
WRC	200	3.00	9.00	6.65	1.16
WLCI	200	5.10	9.70	7.83	0.85
WLLI	200	4.10	9.40	6.00	0.84
WLC	200	3.10	9.10	6.35	1.23
RED_RCiLi	200	60.00	115.00	76.49	10.05
RED_RLiCan	200	62.00	182.00	118.72	21.35
RED_LCiLi	200	61.00	139.00	77.00	11.27
RED_LLiCan	200	61.00	159.00	107.15	20.57

WRCI= Width of Right central incisor, WRLI= Width of Right lateral incisor WRCan=Width of Right canine, WLCI= Width of Left central incisor , WLLI= Width of Left lateral incisor, WLCan = Width of Left canine. RED= Recurring Esthetic Dental proportion, RCiLi= Right Central incisor and lateral incisor, RLiCan= Right Lateral incisor and Canine, LCiLi= Left Central Incisor and Lateral incisor, LLiCan= Left Lateral incisor and Canine.

TABLE 2: DESCRIPTIVE STATISTICS OF AGE OF THE SUBJECTS n=190

Age	Minimum	Maximum	Mean	Std. Deviation	Median	Range
Years	18.3	29.9	22.0	2.62	21.3	11.60

TABLE 3: RED RELATION BETWEEN CENTRAL INCISOR, LATERAL INCISOR AND CANINE IN BOTH GENDERS

	Gender	N	Mean	Std deviation	Sig.	Minimum	Maximum
RED right Central and Lateral incisor	Male	84	78.11	1.05	0.05	61.00	115.0
	Female	116	75.31	9.57		60.0	101.0
RED right Lateral incisor and Canine	Male	84	109.0	1.99	0.11	70.0	150.0
	Female	116	113.0	2.21		62.0	182.0
RED left Central and Lateral incisor	Male	84	77.77	1.09	0.41	61.0	122.0
	Female	116	76.45	1.14		61.0	139.0
RED left Lateral incisor and canine	Male	84	106.44	1.98	0.67	63.0	149.0
	Female	116	107.66	2.11		61.0	159.0

RED= Recurring Esthetic Dental Proportion

significant difference between RED proportion right canine and lateral incisors in both genders ($p=0.11$). However no statistically significant differences was also observed between RED proportion of left central and lateral incisor and left canine and lateral incisor in males and females ($p=0.41$), ($p=0.67$). The mean RED proportion between right and left central incisor and lateral incisor lie in the range of 76.49-77.0%, RED proportion between right and left canine and lateral incisor lie in the 107.15-118.72% range (Table 1).

DISCUSSION

The Recurring esthetic dental proportion describes a constant ratio between the widths of maxillary an-

terior teeth.¹² Lombardi⁶ was the first one who opened up the idea of this 'repeated proportion' in contrast to Levin⁷ idea of golden proportion (1.618:1.0) which is the ratio between the dimensions of a larger and a smaller length. Lombardi⁶ suggestion regarding the use of the repeated proportion in the development of symmetry and proportion for an esthetically pleasing smile is not based on research and could not be compared with the findings of this study.

Recently Ward¹¹ in a web-based study was the first to consider the importance of RED proportion and found that the RED proportion is reliable predictors

for determining the width of maxillary anterior teeth. Sreenivasan³ reported that the RED proportion did not exist between the widths of the maxillary anterior teeth and it was substantiated by Hasanreisoglu et al⁹ Shetty et al¹³, and Rosenstiel et al.¹⁴ The variation in findings among researchers and a lack of research work on Recurring esthetic dental proportion in local population bring the idea of planning current study. The study was conducted on 200 students 89 being male and 111 female subjects to evaluate RED proportion proposed by Ward^{10,11,12} in a subset of Pakistani population with pleasant smile.

The results of this investigation showed that the ratio of the width of maxillary lateral incisor to the width of central incisor was between 76.49 and 77.0%. The ratio of width of canine to the width of lateral incisor was between 107.15 and 118.72%. In the present study, the ratio between central and lateral incisors and between lateral incisor and canine were not constant as suggested by Ward.¹⁰ The ratio increases as one move, distally in the arch from midline. The value 76.49-77.0%, which was the ratio of the width of maxillary lateral incisors to width of central incisors, is in agreement with the 66 and 78% mean RED proportion suggested by Ali Fayyad.¹⁵ There is no evidence in the present study to support the RED proportion theory application to natural dentition. The current study recommends a ratio of 77% between central and lateral incisors, 113% between canine and lateral incisors. There was a significant association between the RED proportions for right lateral incisor to right central incisor in male and females ($P < 0.05$), no other significant association was found between the anterior teeth width and RED proportions with respect to gender which is similar to the findings of study carried out by Gallao et al.¹⁶ The Pakistani population is comparatively diverse with many dental and facial variations as a result of its racial characteristics.¹⁷ Therefore, in order to establish objectively quantifiable width ratio between maxillary anterior teeth, ethnic differences should be taken into consideration. This will help to determine exactly what percentages are truly recurring.

CONCLUSION

Recurring esthetic dental proportion was not found to exist between the six maxillary anterior teeth. A ratio of 77% is recommended between central and lateral incisors and 113% between canine and lateral incisors. There were no statistically significant differences between RED proportions of central incisors, lateral incisors and canine in men and women. In order to establish objectively quantifiable width ratio between maxillary anterior teeth, ethnic differences should be

taken into consideration. This will also help to determine exactly what percentages are truly recurring.

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