Identification of Facial Shape by Applying Golden Ratio in Ethnic Kashmiri Population

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ABSTRACT

Introduction: The golden ratio is a mathematical ratio with special properties and aesthetic significance. Deviations from this ideal can result in health problems and such individuals could be at risk of developing various respiratory, jaw and maxillofacial disorders. Aim of study: Identify the individuals with long face, short face and normal face by applying the golden ratio.

Material and methods: Total 400 subjects were selected for the study with equal number of males and females. Anthropometric measurements were done by using sliding and spreading callipers. Physiognomic facial height, width of face, and physiognomic facial index were measured. After measurements, each subject was compared regarding the ratio between the physiognomic facial height and bizygomatic width. The golden ratio of 1.6 was correlated. The shape was taken normal face when the ratio approximates to 1.6; long face when its ratio was larger than 1.6; and short face when the ratio was smaller than 1.6.

Results: Based on the golden ratio, our results showed that out of 200 subjects in males, 40 (20%) had normal face, 120 (60%) had a short face and 40 (20%) had long face. In females, 63 (31.5%) had normal face, 107 (53.5%) had short face and 30 (15%) had long face. The physiognomic vertical height and width of the face showed significant sexual difference in two groups.

Conclusion: Golden ratio is a simple method to identifying individuals with long or short faces and this can facilitates us for early preventive and corrective interventions so that the population can lead a healthy and normal life.

Keywords: Anthropometry, Facial shape, Golden ratio

INTRODUCTION

Golden ratio or divine ratio is a mathematical ratio believed to be the most esthetically pleasing and harmonious means of design. The various statistical analyses indicate that people giving involuntary preference to the proportions that approximates the divine ratio.[1] It is widely accepted that human body fallows the golden ratio. Nature has designed the human body so that its members are duly proportional to frame as whole.

Golden proportion has been widely used in medical fields like in prosthodontics, surgery, orthodontic, facial attractiveness, and in the development oxygen therapy facial masks.[2,3] Ideal facial proportions are universal regardless of race, sex and age and are based on the phi ratio of 1.618 and deviations from this ideal can result in health problems.[4] Corrective procedures that return the face to this ideal will improve health problems.

The present study was carried out to determine the deviation from golden ratio among two genders and to identify the individuals with long face, short face and normal face by applying the golden ratio and hence such an individual could be at risk of developing maxillofacial or respiratory or jaw disorders.

MATERIAL AND METHODS

After approved by institutional ethics committee, the study was conducted in Government Medical College, Srinagar and the local population served as subjects. Patients provided written informed consent before inclusion. The subjects excluded from the study include subjects having mixed ethnic origin, or who had a history of facial trama or any type of facial surgery. The study group consisted of 400 subjects with equal number of males and females. The age range was 18-30 years. Anthropometric measurements were done by using sliding and spreading callipers. Physiognomic facial height, width of face, and physiognomic facial index were measured. For accuracy every measurement was taken thrice. A third reading was taken final one if the initial two measurements showed a large discrepancy and the two closer readings were then used. The physiognomic facial height and bizygomatic width measurement of each subject were calculated. The golden proportion of 1.6 was correlated. The shape was taken normal face when the ratio approximates to 1.6; long face when its ratio was larger than 1.6; and short face when the ratio was smaller than 1.6.

STATISTICAL ANALYSIS

Graph Pad Prism software, version 3.00 was taken for statistical analysis. The measurements were presented as total number percentage (%), mean and standard deviation (SD). To test the values between two sexes Independent t test was done. $P < 0.05$ were considered as significant.

RESULTS

Based on the golden ratio, our results showed that out of 200 subjects in males, 40 (20%) had normal face, 120 (60%) had a short face and 40 (20%) had long face. In females, out of 200 subjects, 63 (31.5%) had normal face, 107 (53.5%) had short face and 30 (15%) had long face (Table-1, Figure-1). Statistically significant difference were seen in only in normal faces in two genders (p=0.0117)

The linear distance measurements of the two genders (male and female) are presented in Table-2 and Figure-2. The mean physiognomic facial height was more in males (175.25±12.16mm vs. 173.23±11.98mm) as compared to females, this was

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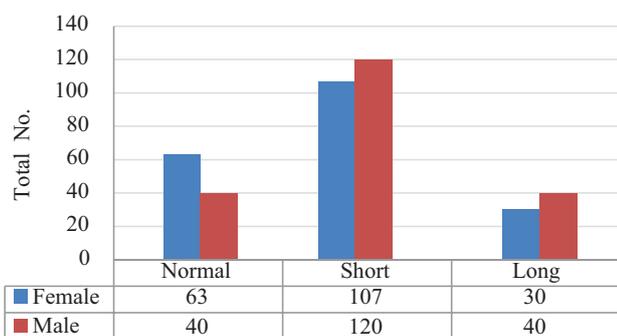
Figure-1: Showing facial types in two genders

	Normal	Short	Long
Female	63	107	30
Male	40	120	40
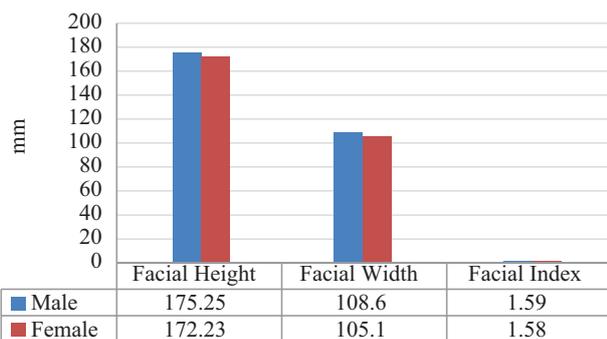
Figure-2: Showing mean facial parameters in two genders

	Facial Height	Facial Width	Facial Index
Male	175.25	108.6	1.59
Female	172.23	105.1	1.58

Facial type	Female (n=200)	Male (n=200)	p value
Normal face	63 (31.5%)	40 (20%)	0.0117*
Short face	107 (53.5%)	120 (60%)	0.2258
Long face	30 (15%)	40 (20%)	0.2361
Values are expressed as percentage (%) and total numbers, *=significant			

Table-1: Comparison of facial types between two genders.

Parameters	Male (n=200)	Female (n=200)	p value
Facial height	175.25±12.16	173.23±11.98	0.0127*
Facial width	108.60±9.61	105.10±13.67	0.0032*
Facial index	1.59±0.16	1.58±0.19	0.5694
Values are expressed as mean ± standard deviation, *=significant,			

Table-2: Comparison of facial measurements between different genders.

statistically significant (p=0.0127). The mean physiognomic facial width was also more in males (108.60±9.61mm vs. 105.10±13.67mm) and statistically significant as compared to females (p= 0.0032).

The facial index measurements of the two genders (male and female) are presented in Table 2 and figure-2. Total facial index (TFI) was calculated in all subjects and results revealed that the mean facial index in males was 1.59±0.16 and in females it was 1.58±0.19. No significant sexual difference was found in facial index (p =0.5694).

DISCUSSION

Medical professionals are now realizing that understanding the golden ratio can have a strong impact to achieve ideal human health and it is suggested that understanding golden ratio can overall improve human health problems particularly maxillofacial and respiratory problems. From the bone structures to internal organs, the golden ratio is expressed throughout in human body in innumerable ways (e.g, normal

heart shape, normal airway passage etc). These examples are just the beginning of the endless number of ways the golden ratio governs our body, formation and functioning. Keeping in mind that face in particular, is the most expressive part of the human body, responsible for visual evaluation and recognition,[3,5] we carried out a study on facial morphology and applied golden ratio to the obtained quantitative data and classified the result in the form of different facial shapes. In our study, we found that the physiognomic facial height and facial width of the face were greater in males with significant sexual dimorphism in two groups. In the present study, we also found that males significantly deviates from the ideal golden ratio (golden faces) as compare to females. P. Saraswathin[6] in a similar type of study also reported sexual dimorphism of face and found that males significantly deviate from the golden ratio as compared to females. Packiriswamy et. al.[7] in their study of facial morphology, showed variations according to gender and race. Only 60 subjects had a regular face shape, and remaining 240 subjects had irregular face shape (short and long) and suggested that facial morphology can be a important tool to find out various types of faces so that early preventive and corrective measures can be taken to avoid respiratory and facial disorders. Zhuang et. al.[8] in their study of facial morphology among gender, ethnicity and age groups, reported statistically significant differences in facial anthropometric dimensions and suggested that respiratory equipment manufacturers can design various respiratory devices for supplying respiratory protective equipment to their employees. Mohammad et. al.[9] in their study of multiracial facial golden ratio and evaluation of facial appearance, reported that no significant association was found between golden ratios. Liu et al.[10] studied "three-dimensional analysis of facial morphology" and reported sexual dimorphism for facial features in both the Chinese and African American populations. Jefferson[4] in their study stated that deviation from the standards (golden ratio) can result in the development of facial abnormalities and disorders.

Sinus cavities tend to be narrow in people having longer faces as compared to normal faces, this results turbulent airflow and breathing problems. These people breath through their mouth which contributes these people for snoring and sleep apnea.[4,11-13] People with shorter faces tend to have abnormal jaw development which causes excessive pressure on the temporomandibular joint. In short faces people, jaw is poisoned in such manner that interferes brain blood flow, results frequent headaches and it further detoriates on clenching and grinding the teeths.[4,14,15]

CONCLUSION

Golden ratio is a simple method to identifying individuals having various types of faces in population so that the early preventive measures can be taken to avoid respiratory, sleep and maxillofacial disorders so that the population can lead a healthy and normal life.

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