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COMPARATIVE EVALUATION OF THE PROPORTION OF UPPER, MIDDLE AND LOWER THIRD FACIAL HEIGHT FOR TESTING THE "RULE OF THIRDS"

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ABSTRACT

Background: The "rule of thirds" is a universal rule governing facial symmetry and attractiveness through facial proportions. **Aim:** The aim of this cross-sectional observational study was to analyze whether "the rule of thirds" resonates with a considerable portion of the Gujarati population by evaluating the proportion of upper, middle and lower third facial height. **Methods:** The study included 202 subjects aged between 20 to 25 years out of which 100 were females and 102 were male. The upper, middle and lower third facial heights were measured by a digital vernier caliper in subjects natural head position. **Results:** Independent t-test and Pearson's correlation coefficient statistical analysis were applied on the collected data to evaluate the relation between upper third facial height, middle third facial height and lower third facial height for testing the applicability of "Rule of Thirds". The significance of the level adopted was 0.05. Males had significantly more ($P<0.001$) upper third, middle third and lower third facial height than females in the sample population. There was significant positive correlation ($P<0.05$) between the upper third facial height and middle third facial height as well as between middle third and the lower third facial height but there was no significant correlation ($P>0.05$) between upper third and lower third facial height in both Gujarati males and females. **Conclusion:** The "Rule of Thirds" is true for facial proportions in Gujarati population. The finding of this study that there is a significant positive correlation between lower third facial height and middle third facial height is of clinical significance as lower third facial height can be estimated from the middle third facial height during occlusal rehabilitation procedures which restore the vertical dimension proving the applicability of "Rule of Thirds" in dentistry in the Gujarati population.

INTRODUCTION

Facial appearance proves to be a critical factor for judging the beauty and facial attractiveness of any individual. Facial aesthetics plays a major role in human perception and social interaction.[1] A well balanced and harmonious facial appearance is often associated with attractiveness that influences first impressions and interpersonal relationships. Symmetry, proportionality, and features such as clear skin and expressive eyes are commonly considered aesthetically pleasing.[2]Italso contributes to self-esteem and confidence of the individual. Every human face is unique and shows a wide range of differences depending on age, sex or race. These differences are usually in relation to symmetry and proportions on face.[3]A universal standard was formulated to evaluate this uniqueness. It was called as the *"Rule of thirds"*. According to it, the face is divided into 3 equal horizontal sections: upper third, middle third and lower third. These resulting thirds are proportionate in a symmetrical and appealing face. This method as given by Dottaviano and Baroudt; provides a structured framework for analyzing and assessing facial features in cosmetic procedures and aesthetics evaluations.[4] This study embarks on the journey of assessing the truthfulness of this rule within Guja-

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rati population. This study aims to fill the gaps present within researches related to facial aesthetics among Gujarati population. Most of the existing researches deal with evaluating facial attractiveness through measuring the *"golden proportion"*.[5] Thus, assessing whether the rule of thirds holds true for Gujarati population not only gives a new insight into the matter but has its own advantages over measuring golden proportion as it assesses the overall facial balance and placement of teeth within facial structure.

This research study aimed to determine the proportion of lower third facial height and compare it to the middle and upper third facial height to test the rule of thirds in young dentulous individuals. The objectives of this study were:

1. To evaluate the proportion of lower third facial height, middle third facial height, and upper third facial height in young dentulous individuals and if the rule of third sholds true for these proportions in Gujarati population.

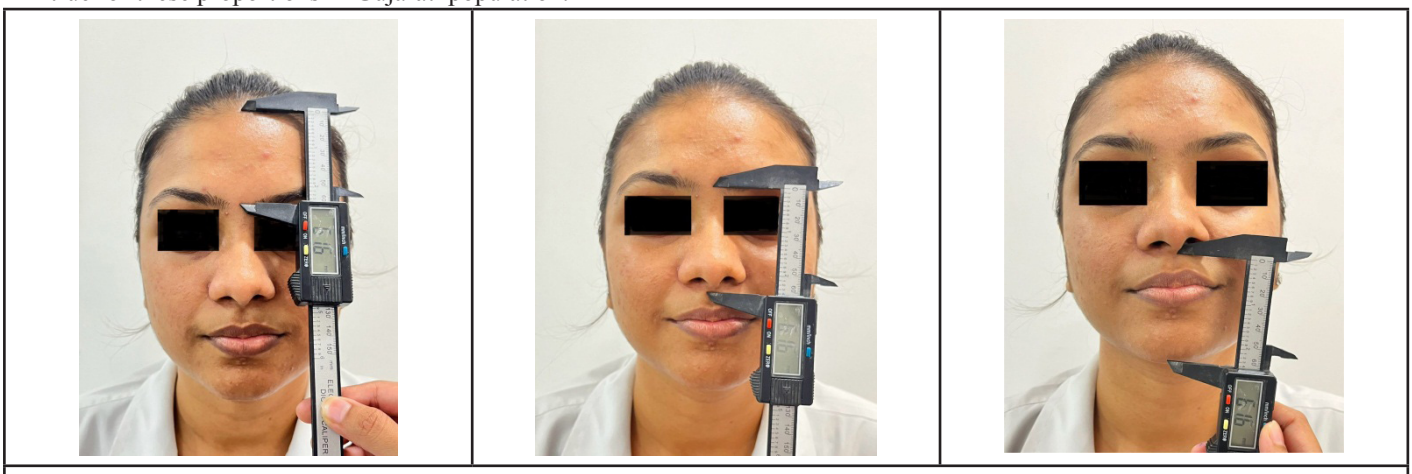


Fig 1. Measurement of upper third facial height, middle third facial height and lower third facial height using digital vernier caliper

2. To compare these proportions between males and females.
3. To determine if any relation exists between upper third facial height, middle third facial height and lower third facial height.

The null hypothesis could be stated that there may not be any significant relation between the proportion of lower third facial height, middle third facial height, and upper third facial height.

MATERIALS AND METHODS

Institutional ethical approval was taken from the Institutional Ethical Committee, Govt. Dental College & Hospital (IEC NO: IEC GDCH/ S.16/ICMR /2023). The study was conducted at Government Dental College and Hospital, Ahmedabad, Gujarat. This was a cross-sectional observational study. A total of 202 young dentulous adults originating from Gujarat and whose mother tongue was Gujarati and were within the age group of 20-25 years with no history of congenital or acquired facial deformity were observed out of which 100 were females and 102 were males. Individuals with a history of maxillofacial surgery of the face, plastic surgery of the face or any orthodontic treatment were also excluded from the study. Written informed consent form was taken with the participant's name, age, phone number, date of data collection, and signature. Participants were given contact information in case they needed to inquire about anything related to the study.

The subjects were made to sit in an upright relaxed position with their backs supported and heads and shoulders straight and arms hanging free beside the trunk. The soft tissue points Trichion(Tr), Glabella (Gl), Subnasale (subN), and Menton(Me) were identified on their face with careful inspection. A digital vernier caliper (Skadioo Inc.) was used to measure the upper third facial height from Trichion to Glabella, the middle third facial height from Glabella to Subnasale, and the lower third facial height from Subnasale to Menton as shown in Fig 1. Data was thus obtained by measuring the upper third, middle third, and lower third facial height of subjects. Every measurement was obtained thrice by the same observer and then by another observer and an average of three readings was taken to reduce the intra-observer and the inter-observer bias. Data was tabulated manually first on paper and then transferred to Microsoft Excel.

RESULTS

The data were described as proportions, mean ± standard deviation, and median. Kolmogorov Smirnov test was applied to determine the normality of the data. The data was found to be normally distributed by the Kolmogorov Smirnov test. The ratio statistics were done to assess the ratio between the facial thirds. Then, independent t-test was used to compare the mean difference of upper third facial height, middle third facial height and lower third facial height between male subjects and female subjects. Also, Pearson's correlation coefficient test was done to test whether any correlation exists or not in upper third facial height, middle third facial height and lower third facial height. Statistical Package for Social Science (SPSS version 23, IBM Corp.) was used for the entire analysis. The level of significance was set at 0.05.

The ratio (mean +/- SD) of upper third facial height to middle third facial height, upper third facial height to lower third facial height and middle third facial height to lower third facial height for both males and females are shown in Table 1. Value of ratio of 1 or close to 1 indicated that the facial heights being compared were almost equal and thus the "Rule of Thirds" holds true for the study population. The coefficient of concentration within 20 % of the median inclusive was found to be 98% in females and 92.16% in males for ratio of middle

Table 1. Gender-wise ratio statistics between facial thirds heights in males and females to test the rule of thirds

Facial height	Gender	Mean Ratio ± SD	Median	Coefficient of Concentration Within 20% of Median inclusive
Upper third to Middle third	Male	1.02 ± 0.12	1.00	90.20%
	Female	1.01 ± 0.11	1.01	93.00%
	Overall	1.01 ± 0.12	1.00	91.58%
Upper third to Lower third	Male	1.06 ± 0.16	1.06	82.35%
	Female	1.12 ± 0.14	1.11	90.00%
	Overall	1.09 ± 0.15	1.08	85.15%
Middle third to Lower third	Male	1.04 ± 0.13	1.03	92.16%
	Female	1.11 ± 0.11	1.12	98.00%
	Overall	1.08 ± 0.12	1.07	94.06%

third facial height and lower third facial which means that 98 % females and 92.16 % males had almost equal middle third facial height and lower third facial height.

Further, highly significant difference (P<0.001) was found on comparing the facial heights between males and females by independent t-test as shown in Table 2. This difference in facial height in males and females is of clinical importance for aesthetic assessments during restorative procedures affecting the lower third facial height as it was found that males have significantly more upper third facial height, middle third facial height and lower third facial height than females in the sample population.

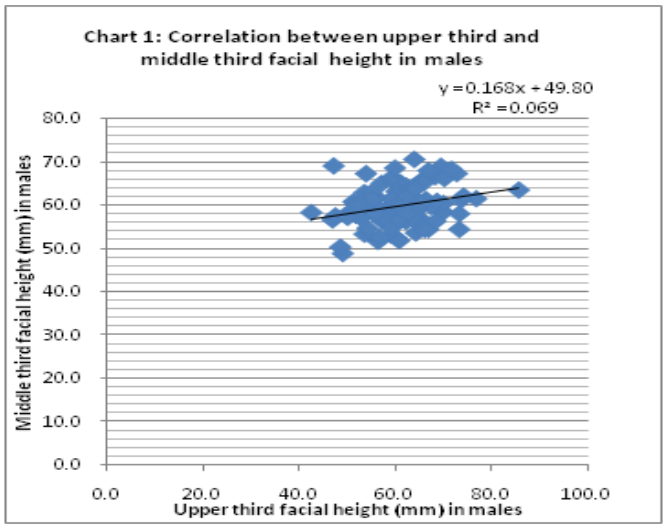
On evaluating the correlation between the upper third facial height, middle third facial height and lower third facial height in males and females by Pearson's correlation coefficient as shown in Table 3, it was found that there was a statistically significant positive correlation (p=0.007) between the upper third facial height and middle third facial height (Chart 1), statistically significant positive correlation (P=0.041) between middle third facial height and lower third facial height (Chart 2) but no significant correlation (P=0.183) between upper third facial height and lower third facial height (Chart 3) in male subjects. Also, it was found that there was a statistically significant positive correlation (p=0.006) between the upper third facial height and middle third facial height (Chart 4), statistically significant positive correlation (P=0.008) between middle third facial height and lower third facial height (Chart 5) but no significant correlation (P=0.655) between upper third facial height and lower third facial height in female subjects (Chart 6).

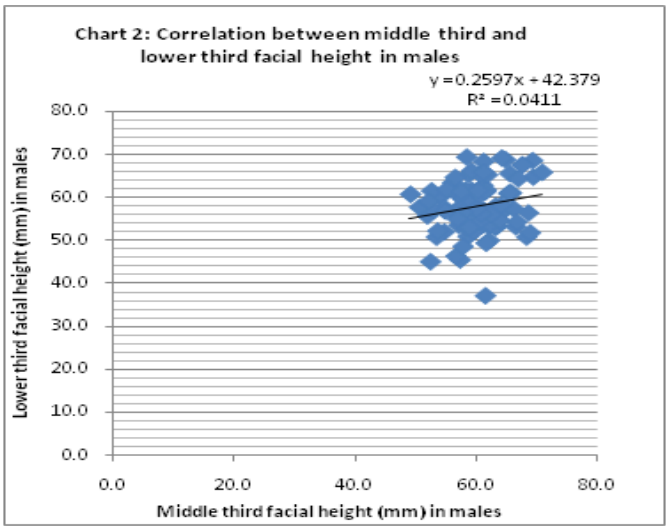
Table 2. Gender-wise comparison of mean facial height (mm) by independent t-test

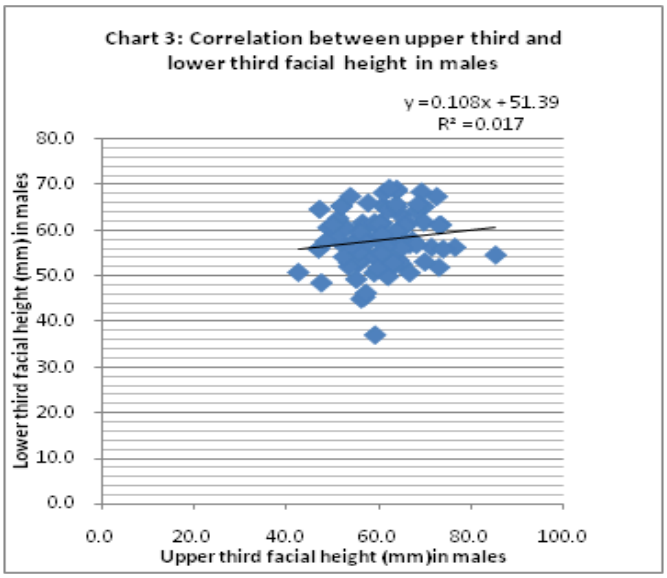
Facial height	Gender	Mean ± SD (mm)	95% CI (mm)	P-Value
Upper third	Male (n=102)	60.77 ± 7.11	0.97 – 4.63	<0.001*
	Female (n=100)	57.97 ± 6.03		
Middle third	Male (n=102)	60.01 ± 4.52	1.17 – 3.61	<0.001*
	Female (n=100)	57.63 ± 4.27		
Lower third	Male (n=102)	57.96 ± 5.79	4.52 – 7.30	<0.001*
	Female (n=100)	52.05 ± 4.10		
* Statistically significant as P<0.05				

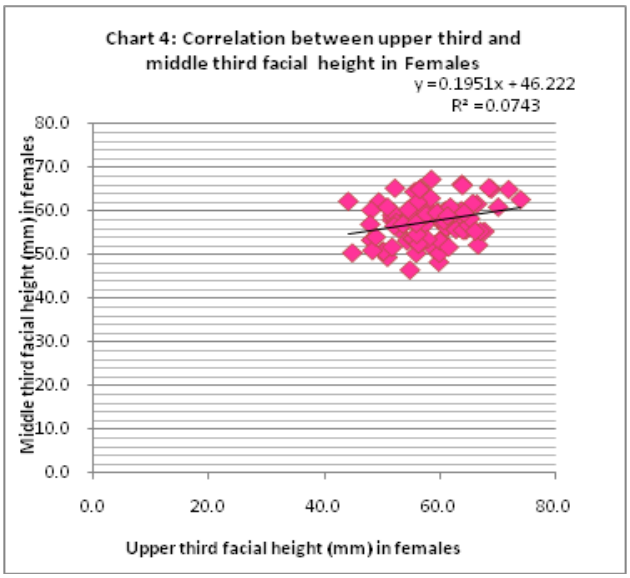
Table 3. Pearson's Correlation between upper third facial height, middle third facial height and lower third facial height in males and females

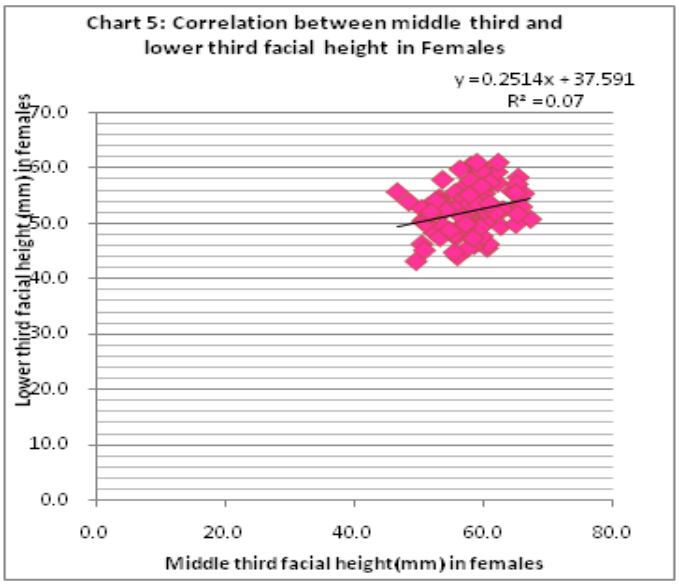
Gender (N)	Correlation between Groups	r^2	Pearson's Correlation Coefficient (r)	P-Value
Male (N=102)	Upper third and Middle third	0.06994	0.2645	0.007*
	Middle third and Lower third	0.04109	0.2027	0.041*
	Upper third and Lower third	0.01763	0.1328	0.183
Female (N=100)	Upper third and Middle third	0.07433	0.2726	0.006*
	Middle third and Lower third	0.07003	0.2646	0.008*
	Upper third and Lower third	0.01763	0.1328	0.655
* Statistically significant as P<0.05				

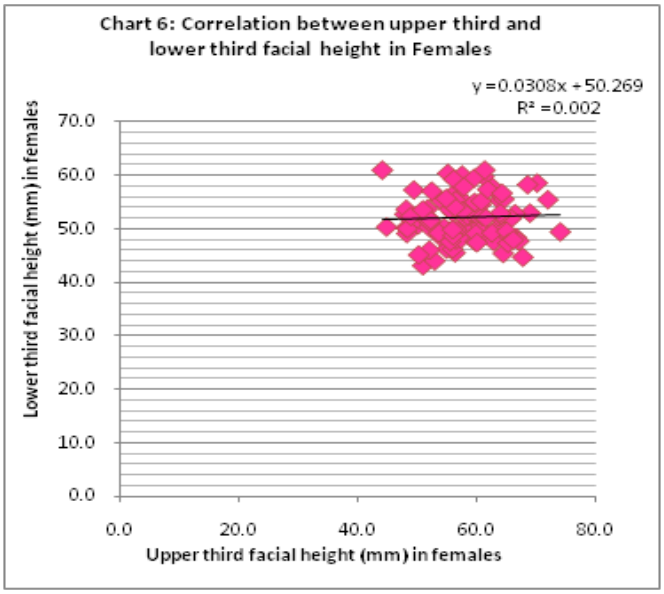












DISCUSSION

The results of this study yielded valuable insights into facial proportions. These findings carry substantial implications for treatment planning during clinical procedures involving restoration of vertical dimension like occlusal rehabilitation and complete denture fabrication. Moreover, the research underscores the importance of considering demographic variables such as gender in facial assessments to achieve optimal aesthetic outcomes. In essence, the study contributes

to a deeper understanding of facial aesthetics within a specific cultural context, offering valuable insights for clinicians and researchers alike.

A similar study regarding the evaluation of facial beauty suggested that in attractive women rule of thirds holds true whereas in anonymous women it proved to be false. Most of their facial features closely matched ideal aesthetic proportions, highlighting consistent differences in facial harmony and size between the two groups.[6]Some studies shed light on how certain changes in facial features and proportions change the whole understanding of attractiveness. One such study concluded that facial attractiveness is enhanced by larger eye size and smaller nose and lip proportions and results of that study reinforced the idea that our perception of beauty is strongly influenced by specific facial ratios and proportions, rather than just subjective opinion.[7]On the other hand, certain studies throw light on the role of cultural factors in defining aesthetic standards. By comparing aesthetic criteria between Caucasian and East Asian populations, the study addresses the need for cultural sensitivity in cosmetic procedures and highlights the importance of preserving ethnic identities while enhancing facial aesthetics.[8]In a study similar to our study conducted by Sadaccharan et al.[9]on Indian Americans forehead height in women was found to be greater than in men although mid-face height and lower-face height were found to be higher in men compared to women whereas our study conducted with Gujarati subjects shows that facial height in all the thirds is greater in the case of males as compared to females. This difference could be attributed to varying ethnic origins and future research in individuals with different ethnic origins should be conducted.

The implications of the findings extend beyond the realm of dentistry, reaching into the broader fields of anthropology, sociology, and cultural studies, providing insights into how cultural backgrounds shape perceptions of beauty and facial harmony. Moreover, such insights have the potential to enhance communication between dental practitioners and patients, fostering a more culturally sensitive approach to treatment planning. The results obtained from this study can be useful for aesthetic procedures in dentistry like orthodontic treatment, prosthodontic rehabilitation and smile design where the clinician can plan the aesthetic and restorative procedures such that the proportions of facial height are as close as possible to those that exist naturally in our population. Also, the significant positive correlation between upper third and middle third facial height can be of clinical use during hair transplant procedures as the upper third facial height (and thus the hairline) can be estimated from the middle third facial height. It could also be of significance in anthropology for human identification using facial features.[10]While the current study provides valuable insights into the comparative evaluation of lower third facial height, future research could explore additional factors influencing facial proportions, such as ethnicity, facial morphology, and cultural preferences. Further investigations could also focus on developing predictive models that incorporate a broader range of variables for a more comprehensive analysis of facial aesthetics.

CONCLUSION

The findings of this study are:-

The ratio of upper third facial height to middle third facial height, upper third facial height to lower third facial height and middle third facial height to lower third facial height for both males and females is close to 1. This proves that the "Rule of Thirds" is true for these facial proportions in the Gujarati population.

1. The upper third facial height, middle third facial height and lower third facial height is significantly more in males compared to females.
2. There is a significant positive correlation between lower third facial height and middle third facial height in both males and females. It is of clinical significance as lower third facial height can be estimated from the middle third facial height during occlusal rehabilitation procedures which restore the vertical dimension proving the applicability of "Rule of Thirds" in dentistry in the Gujarati population.
3. There is significant positive correlation between upper third and middle third facial height in both males and females. This can be of clinical use during hair transplant procedures as the upper third facial height (and thus the hairline) can be estimated from the middle third facial height.

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