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Original Article

Photographic Analysis of Facial Soft Tissue by Angular and Proportional Measurements in Adult Pakistani Population

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ABSTRACT

An important requisite of orthodontic treatment is achieving well balanced, pleasant face. Precise diagnosis and treatment planning, on facial hard and soft tissue norms basis, is fundamental for that purpose. **Objective:** To use photogrammetry technique on standardized photographs, and determination of mean angular and proportional parameters defining characteristics of facial soft tissue, on an adult Pakistani population. **Methods:** A cross sectional study, on 78 subjects from OPD and students of FMH College of Medicine and Dentistry, were selected. Data were entered and SPSS 2.0 was used for analysis. Mean and standard deviations were used for the quantitate variables used in the study. To control confounders with respect to age and gender, stratification was done and independent t-test was used, taking statistically significant p-value at ≤ 0.05. **Results:** All parameters were statistically insignificant on the basis of gender and age. The average values of nasolabial angle, angle of facial convexity and facial height proportion were greater in males than in females. The mean values of mentolabial angle, lower face to total face height and facial index were found to be greater in females as compared to males. **Conclusions:** This study concluded that gender and age based average values for angular and proportional parameters should be used while planning cases for Pakistani population for orthodontic treatment.

INTRODUCTION

The word Orthodontic, derivated of Greek word 'orthos', means “to straighten” and 'dontos' meaning “teeth” [1-13]. This field of dentistry deals with the correction of anomalies of jaws and dentition. Malocclusions has high prevalence and its consequences are unsatisfactory, physically and socially [2-16]. This impairs the quality of an individual's life and alters appearance and functions [2-17]. The aim of an orthodontist is hence correction of skeletal and soft tissue disharmonies and in addition to that of teeth, during diagnosis treatment planning [3-11]. For the purpose of evaluating an orthodontic case thoroughly, photogrammetry is being used worldwide consistently [4-15]. Photogrammetry serves as an alternative to directly measuring patients in clinical settings, enabling the determination of distances and angles between facial landmarks through both 2D and 3D approaches [4-19]. Extracting measurements from photographs offers operators greater convenience, minimizes patient intrusion, and proves to be more time and cost-effective [4]. Apart from its various uses, its extensive usage in the field of orthodontics enables to develop the standard normal values for skeleton, soft tissue and dentition [4-12]. From researches done on different populations, the average values have been obtained. The measurement-

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based assessment of facial soft tissue dimensions and contours is extensively utilized across diverse medical fields, including Orthodontics [4]. Facial appearance is dependent on many factors; sex, age and ethnicity, to name the few, hence, it is obvious to conclude that what is considered to be attractive as the norm for one culture, may not be so for another [4-11]. Therefore, it is impertinent that for different populations, different standards norms should exist.

The objective of this study was to create average angular and proportional photogrammetry norms of adult Pakistani population, further aiding diagnosis, planning treatment and favorable outcomes of esthetics and stability at commencement of treatment, due to limited local literature and the variability of these parameters amongst different populations.

METHODS

The research carried out was descriptive cross- sectional, and 78 subjects were piloted, calculated at 5% level of significance and 1% margin of error and by taking expected mean of facial index as 84.58 ± 4.48, using 95% confidence level, at 5% level of significance in Department of Orthodontics, Fatima Memorial Hospital College of Medicine and Dentistry Lahore. The duration of this research was 1.5 years, from January, 2020 till June, 2021. IRB department of FMH College of Medicine & Dentistry permitted this research concept in December, 2019 (IRB Letter: FMH-12-2019-IRB-698-M), demographic data were recorded and informed consent was taken from all participants. Non-probability consecutive sampling technique was used. Subjects reporting in dental OPD of FMH, should be a Pakistani descent, with age bracket of 15-35 years, with developed dentition and straight well balanced facial profile, having class I occlusion pattern, with minimal or no crowding of teeth, were included in the study, under inclusion criteria. The set-up for photographs comprised of a tripod, holding a camera (DSLR, Nikon D7200) with flash. Facial photos were taken from frontal and profile aspects with standard method of all subjects, in neutral head position. All photographs were printed and labelled, and calculations were drawn on them. Photographic variables were logged in a precisely made proforma. All the data collected was then entered and analyzed in SPSS version 20 computer program. Variables that were quantifiable; age, angle of facial convexity (G-Sn-Pg), nasolabial angle (NLA), facial height proportions (MFH ÷ LFH and LFH ÷ TFH), facial index (facial height ÷ width × 100) and Mento-Labial Angle (MLA) were exhibited as mean and standard deviation. Frequency and percentages were used for qualitative data i.e. gender. In reference to age and gender; stratification was done to control confounders and "t" test was applied. 0.05 or less was appointed for P-value to be significant statistically.

RESULTS

A 78 subjects with straight profile and class 1 skeletal pattern were part of the research. As evident from table 1, the median age; 24.48 ± 5.38 years was observed, of which 43 (55.1%) were women and 35 men (44.9%). In addition, statistically insignificant differences were present in all age brackets, across all variables table 1.

Table 1: Angular and Proportional Calculations from Age Groups Perspective

Variables		Age Groups (Years)				p-Value
		15-19	20-24	25-29	30-35	
(Mean ± SD)						-
Angular Variables	Nasolabial Angle	100.65 ± 8.86	102.35 ± 8.41	99.05 ± 10.36	99.18 ± 4.97	0.638
	Mentolabial Angle	127.52 ± 9.75	127.17 ± 10.50	127.33 ± 12.06	129.45 ± 13.40	0.899
	Angle of Facial Convexity	168.91 ± 5.91	167.83 ± 5.49	169.81 ± 4.25	172.64 ± 4.86	0.092
Proportional Variables	Lower Face-Total Face Height	53.91 ± 5.06	53.87 ± 2.26	53.90 ± 3.30	54.97 ± 6.23	0.909
	Facial Index	86.26 ± 5.01	87.96 ± 4.49	87.81 ± 4.67	88.55 ± 2.20	0.524
	Facial Height Proportion	1.18 ± 0.04	1.15 ± 0.13	1.15 ± 0.10	1.18 ± 0.10	0.449

Similarly, as seen from table 2, sexual dimorphism was found in all parameters, including NLA (nasolabial angle), MLA (mentolabial angle), and G-Sn-Pg (angle of facial convexity), LFH ÷ TFH (lower face height to total face height), facial height ÷ width × 100 (facial index), and MFH ÷ LFH (facial height proportion).

Table 2: Angular and Proportional Calculations from Gender Perspective

Variables		Gender		p-Value
		Males	Females	
		Mean ± SD		
Angular Variables	Nasolabial Angle	100.97 ± 8.05	100.14 ± 9.26	0.888
	Mentolabial Angle	125.94 ± 11.52	129.02 ± 10.43	0.178
	Angle of Facial Convexity	169.91 ± 5.41	168.91 ± 5.34	0416
Proportional Variables	Lower Face-Total Face Height	53.79 ± 3.96	54.26 ± 4.23	0.358
	Facial Index	86.77 ± 5.28	88.09 ± 3.63	0.133
	Facial Height Proportion	1.17 ± 0.08	1.16 ± 0.11	0.964

The NLA (nasolabial angle) and G-Sn-Pg (angle of facial convexity) showed higher values in mem as compared to women on average angular measurements Table- 2. However, MLA (mentolabial angle) was larger in females versus male's table- 2. Typically, lower face height to total face height (LFH ÷ TFH) and Facial index (height ÷ width × 100) calculations were found to be greater in female's. Facial height proportion on the other hand was smaller in females versus male's (Table 2).

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DISCUSSION

Pandian KS *et al.*, studied angular photogrammetric analysis of Indian adults and showed in their study, that NLA (Nasolabial Angle) and MLA (Mentolabial Angle) showed significant statistical differences, based on gender, and these angles exhibited significant diversity in maximum and minimum values in both genders. The NLA and MLA were more acute from statistical standpoint in females versus males [9]. Our study revealed in comparison, all angular measurements including NLA and MLA, to be statistically insignificant, on both gender and age basis. In 2019, Akter L *et al.*, studied facial profile analysis of soft tissue of young Bangladeshi adults and proposed that average angular measurement for MLA were broader in women. The average estimates for NLA was higher in males. Statistically significant difference was displaced for mentolabial angle. Highest variability for MLA was evident [10]. Contrarily, the average angular and proportional values in our study for NLA were larger in males (100.97 ± 8.053 vs 100.14 ± 9.267). Whereas, MLA had higher values in women than in men (129.02 ± 10.43 vs 125.94 ± 11.52). Imtiaz A *et al.*, in 2022, studied facial profile convexity and found gender dimorphism with higher average value of G-Sn-Pg (angle of facial convexity), i.e.; 23.22 ± 7.61 in women [20]. On the other hand, in our study G-Sn-Pg, was more acute in women (169.91 ± 5.41 vs 168.91 ± 5.34). In 2022, Rao SJ *et al.*, researched soft tissue treatment goals for orthodontic patients- a photogrammetric analysis of facial profile for soft tissue norms and gender variations in young adults, Hyderabad [21]. They found significant sexual dimorphism in the angular measurements including (angle of facial convexity; women-173.2° ± 4.4°, men-169.6° ± 54.8°). In their study, NLA (Nasolabial, p-value=0.314), and MLA (Mentolabial, p-value=0.798) angles showed remarkable variability. In contrast our research yielded, all angular and proportional measurements to be statistically insignificant, on both gender and age basis. Kır İrem *et al.*, in 2024, evaluated facial aesthetics in young-adult Turkish society and found Facial height ÷ width× 100 (facial index) and G-Sn-Pg (angle of facial convexity) to be showing a larger value in women from statistical point of view, whereas, height proportions were lower [22]. In our research, however, lower face height to total face height (LFH ÷ TFH) (males= 53.79 ± 3.96, female= 54.26 ± 4.23) and Facial index (height ÷ width × 100) were found to be greater in females (males= 86.77 ± 5.28, females= 88.09 ± 3.63). Facial height proportion (MFH ÷ LFH) on the other hand was smaller in females (males= 1.17± 0.08, females= 1.16 ± 0.11). As depicted by these variations in different researches, average values must always be applied for the specific demographic group. The results are anticipated to offer substantial objective databank, which will further help in diagnosing and for case planning for best pretreatment and postoperative results.

CONCLUSIONS

Angle of facial convexity, Nasolabial angle, Lower face to total facial height proportion, Mentolabial angle, Facial height proportion, and Facial index, displayed no sexual dimorphism. Age distribution did not yield significant differences across all parameters. The means of Facial height proportion, Nasolabial angle and Angle of facial convexity were found to be higher in men. The mean values of Facial Index, Mentolabial angle and Lower face to total face height, displayed higher estimates in women than in men.

Authors Contribution

Conceptualization: AZ
Methodology: MFN
Formal analysis: MFN, SA, KH
Writing, review and editing: QK, NH

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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