

ORIGINAL ARTICLE

Photographic Facial Soft Tissue Analysis by Means of Linear Measurements in Adult Pakistani PopulationANUM AZIZ¹, MUHAMMAD IMRAN RAHBAR², NASEER AHMAD CHAUDHRY³, SAADIA ATA⁴, QASIM KHALID⁵, SAPNA NADEEM⁶¹Senior Registrar, Department of Orthodontics, Avicenna Medical and Dental College, Lahore, 54810, Pakistan.²Professor Orthodontics, Fatima Memorial College of Medicine and Dentistry, Lahore, 54810, Pakistan.³Professor Orthodontics, Fatima Memorial College of Medicine and Dentistry, Lahore, 54810, Pakistan.⁴Assistant Professor Orthodontics, Akhtar Saeed Medical and Dental College, Lahore, 54810, Pakistan. saadia_ata@yahoo.com⁵Senior Registrar Orthodontics, Avicenna Medical and Dental College, Lahore, 54810, Pakistan. qkhalid22@gmail.com⁶Specialist Orthodontist, PureSmile Orthodontics & Dentistry, Shanghai, 200052, China. sn.mijgaan@gmail.comCorrespondence to: ANUM AZIZ, Email: anum.ziz@hotmail.com, Cell: 03244617790.**ABSTRACT****Background:** Achieving pleasant and well balanced face is primary objective of orthodontic management. Comprehending facial tissues and acceptable range of structures, allows formulation of treatment plan.**Objectives:** This study rationale was to establish mean linear photogrammetry norms for adult Pakistanis, to aid in diagnosis, planning of treatment, esthetics and stability in the therapy results, for local population.**Methods:** A cross sectional study, on 78 subjects from Fatima Memorial Hospital and undergraduate scholars of Fatima Memorial College of Dentistry. Gathered data was logged and examined in SPSS 20. Quantitative variables were expressed as mean and standard deviation. Categorization of gender and age was carried out to check distractors and independent t-test was used, with p-value ≤ 0.05 as significant statistically.**Result:** Result of this research exhibited marked variation in genders for length of lower lip, which was shorter in females than males. The length of lower lip which was significant on the basis of gender, was statistically insignificant on the basis of age. All other parameters showed statistically insignificant difference on the basis of gender and age.**Conclusion:** This research concluded that average values for gender and age for linear parameters must be used while planning cases for orthodontic therapy of patients of Pakistani origin.**Keywords:** Photogrammetry, Esthetics, Soft Tissue, Orthodontics, Treatment Planning, Diagnosis.**INTRODUCTION**

Orthodontics is a field concerned with discrepancies of jaws and malocclusions associated with them and their therapy^{1,2}. Malocclusions can consequently influence health and wellbeing of a person and harm outlook and functions^{1,2}. Orthodontics deal with teeth position in jaw, as well as soft and hard tissues of the patient's face, during orthodontic therapy and treatment planning of a particular face³. The shift of Orthodontics from the Angle paradigm to Soft tissue paradigm, intends to establish correct and ideal soft tissue relationships and then making hard tissues i.e. Teeth and jaws, to meet those soft tissue goals^{3,6}. Photogrammetry is now being used as an exceptional modality to help diagnose and plan orthodontic case^{4,5,7,8}. Photogrammetry is a substitute of clinical measurements on patient, to get distances and angles on face, using 2D and 3D techniques¹⁰. It has a widespread use in orthodontics to formulate average values for dentition, hard and soft tissues, in specific populations^{9,11}.

As facial countenance differs on the basis of age, gender and ethnic background, it is apparent that what might be considered pleasant in one specific cultures, may not be so in another^{10,11}. Hence, it is crucial to formulate normal standards for various populations.

This study rationale was to establish mean linear photogrammetry norms for adult Pakistani population, which will aid in diagnosing, planning therapy and better esthetics and balance in the treatment results, as limited literature is available locally and these parameters vary from population to population.

MATERIAL AND METHODS

Orthodontic department conducted six months cross-sectional study in Fatima Memorial Hospital College of Medicine and Dentistry, Lahore. Orthodontic department. Using 95% confidence level, sample size was assessed as 78 subjects, with level of significance at 5%. Institutional Review Board (IRB) of FMH College of Medicine & Dentistry approved the study, and informed assent was obtained from the subjects and demographic profile was documented. For sampling technique, consecutive sampling (Non-probability) technique was availed. The subjects included in this study, subjects had to be of Pakistani origin, with age range of 15 to 35 years, presenting in dental OPD at FMH Lahore, with fully

developed adult dentition and facial profile, minimal or absence of crowding in Class I occlusion, with fully erupted dentition excluding third molars, clinically determined, skeletal class I pattern, orthognathic, pleasing and balanced profile and good facial symmetry. The set-up for photography constituted of a DSLR camera (Nikon D7200) on tripod and a flash. The records of profile and frontal views of the face were taken in natural head posture. The landmarks were then transferred on the printed photographs, to obtain all the measurements manually.

The data was collected, logged and scanned in computer program SPSS version 20. Quantitative variables like age, inferior facial third, length of upper lip, length of lower lip, height of chin, facial depth, nasal depth, lower face-face height, nasal base width, nasolabial angle, mento-labial angle, and angle of facial convexity, facial index and facial height proportion were displayed by mean and standard deviation. Qualitative data like gender were displayed as frequency and percentages. Categorization of gender and age was carried out to check distractors and independent t-test was used, with p-value ≤ 0.05 as significant statistically.

RESULTS

78 subjects having Class I skeletal pattern, were included in this study. The average age of participants was 24.48 ± 5.386 years with minimum and maximum ages of 15 & 35 years respectively. Out of a sample of 78, 43 (55.1%) were females and 35 (44.9%) were males. Table # I

Our findings showed statistical significant ($p < 0.05$) sexual dimorphism for the length of lower lip, which was shorter in length in females (14.86 ± 2.145), than males (16.29 ± 2.383). The values which didn't exhibit statistically significant sexual dimorphism were inferior facial third, length of upper lip, height of chin, facial depth, nasal depth, nasal base width, nasolabial angle, mentolabial angle, angle of facial convexity, lower face to total face height, facial index, facial height proportion. Table # II. The average linear values of inferior facial third, length of upper lip, and length of lower lip, facial depth and nasal depth were greater in males than in females. Whereas, height of chin and nasal base width were found to be greater in females as compared to males. Table# II

The linear findings revealed statistically insignificant differences among all age groups. The parameters which were statistically insignificant on the basis of age were inferior facial

third, length of upper lip, length of lower lip, height of chin, facial depth, nasal depth, nasal base width, nasolabial angle, mentolabial angle, angle of facial convexity, lower face to total face height, facial index, facial height proportion. Table # III

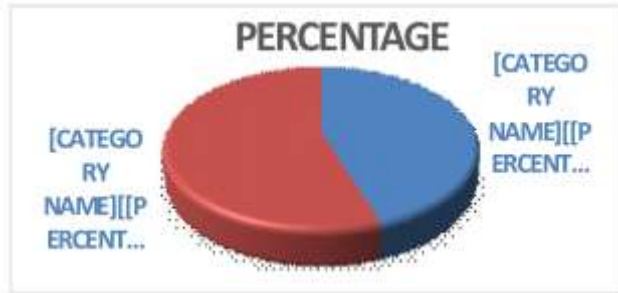


Figure-I: Frequency distribution showing patient's gender

Table-I: Frequency and percentage of different ages of demographic population

Variable	Gender			P-Value
	Male: 35 (44.9%)	Female: 43 (55.1%)	Total 78(100%)	
Age	21.94 ± 5.708	24.35 ± 4.913	24.48 ± 5.386	.035

Table -II: Descriptive statistics of linear measurements on the basis of gender

Variable	Gender		P-Value
	Male	Female	
Inferior Facial Third	53.31±4.664	52.30 ±4.470	.293
Length of Upper Lip	16.29±2.585	15.16±2.439	.068
Length of Lower Lip	16.29±2.383	14.86±2.145	.007
Height of Chin	20.54±4.913	21.23±4.487	.490
Facial Depth	84.77±6.131	83.98±6.120	.521
Nasal Depth	22.00±3.597	21.79±4.003	.754
Nasal Base Width	23.14±5.048	23.49±4.211	.522

Table III: Descriptive statistics of linear measurements on the basis of age distribution

Variable	Age				P-Value
	15-19	20-24	25-29	30-35	
Inferior Facial Third	53.39±4.989	52.78±4.134	52.71±4.173	51.45±5.466	.718
Length of Upper Lip	15.26±2.717	15.09±2.214	15.81±2.462	17.45±2.505	.089
Length of Lower Lip	16.00±2.449	15.04±2.306	14.95±2.179	16.45±2.339	.238
Height of Chin	20.22±4.285	21.35±5.491	20.57±4.081	22.18±4.895	.635
Facial Depth	83.48±5.116	84.87±7.244	84.38±5.826	84.91±6.534	.966
Nasal Depth	22.22±3.753	22.04±4.194	21.62±3.514	21.36±4.032	.922
Nasal Base Width	22.00±4.167	23.61±4.812	23.57±4.249	25.09±5.319	.395

DISCUSSION

The Quantitative facial soft tissue average measurements are amongst key aids in diagnosis and for orthodontic therapy plan. These established norms are not applicable to other races unless they are modified to suit a specific demographic group, as particular values may appear pleasant in subjects of one particular group and unpleasant in some other.

These values standardize case planning and prediction of posttreatment surgical outcomes, by orthodontists, maxillofacial and plastic surgeons. Linear measurements were assessed and sexual dimorphism was also evaluated, in this study. Our findings showed statistical significant ($p < 0.05$) sexual dimorphism for the length of lower lip, which was shorter in length in females (14.86 ± 2.145), than males (16.29 ± 2.383). Furthermore, these linear findings revealed statistically insignificant differences among all age groups 15-19 years old, 20-24 years old, 25-29 years old and 30-35 years old. The average linear values of inferior facial third, length of upper lip, length of lower lip, facial depth, nasal depth, were greater in males than in females. Whereas, height of chin, nasal base width, were found to be greater in females as compared to males.

Morosini IAC et al, found that the mean value for vermilion extension of lower lip was 10.95 ± 1.73 mm, in their research. The lower lip length mean found was 46.18 ± 3.32 mm and it was significant statistically. The lower facial height was 69.76 ± 4.89

mm. It was statistically insignificant². These results were similar and comparable to our study. In our findings, lower lip length showed statistical significant ($p < 0.05$) sexual dimorphism, which was shorter in length in females (14.86 ± 2.145), than males (16.29 ± 2.383). Facial height proportion was also statistically insignificant (0.964) Males= 1.1777 ± 0.08819 and females= 1.1612 ± 0.11630 .

Hameed A et al. demonstrated in their study conducted at Children's Hospital, Lahore that the males had longer lower lip length than that of females but upper lip length has very trivial difference, which was in accord with our study⁴. In our study lower lip length showed statistical significant ($p < 0.05$) sexual dimorphism, which was shorter in length in females (14.86 ± 2.145), than males (16.29 ± 2.383).

In study by Ijaz et al, and sexual dimorphism was shown by facial depth, nasal depth, labial and chin in majority of measurements in horizontal dimension. Females had greater values in length of mid face, nose, lips and height of chin and nasal tip, when they also had increased growth tendency in vertical dimension. On comparison of upper and lower lip vermilion, in the male subjects the lower lip showed a trifling increase, whereas in the females the lower lip vermilion was fairly prominent in the vertical dimension⁶. Whereas, in our study significant sexual dimorphism was displayed by lower lip length, which was shorter in length in females than males.

These abovementioned variations clearly demonstrate that variances must always be kept in mind and average values must always be applied for the specific demographic group.

The linear measurements useful for characterizing and quantifying morphology of the face and consistently can be assessed photographs of the face. The use of photographs is proven to be conveniently repetitive, economical, non-intrusive diagnostic substitute, for diagnostic research, when a standard procedure is observed.

In this study, in terms of sexual dimorphism, it can be deduced that mean values of soft tissue for facial parameters ought to be adopted as reference, only for this particular ethnic and racial group.

CONCLUSION

This study concluded that:

- The subjects of Pakistani origin, displayed remarkable dimorphism on the basis of gender, in lower lip length. Females displayed shorter values than males.
- In the inferior facial third, length of upper lip, height of chin, facial depth, nasal depth, nasal base width, nasolabial angle, mentolabial angle, angle of facial convexity, lower face to total face height, facial index, facial height proportion parameters, dimorphism on the basis of gender was not apparent.
- All parameters showed insignificant differences on the basis of age distribution. Males had greater average values of inferior facial third, length of upper lip, length of lower lip, facial depth, nasal depth, nasolabial angle, angle of facial convexity and facial height proportion.
- The mean values of height of chin, nasal base width, mentolabial angle, lower face to total face height and facial index were found to be greater in females as compared to males.

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