

## DEFINING NORMS FOR THE UPPER AND LOWER LIPS OF THE HIMACHALI ETHNIC POPULATION: A CEPHALOMETRIC STUDY

Isha Aggarwal<sup>1</sup>, Manu Wadhawan<sup>2</sup>

<sup>1</sup>Senior lecture, Department of Orthodontics and Dentofacial Orthopaedics, Gian Sagar Dental College and Hospital, Punjab, India

<sup>2</sup>Private Practitioner, Eakdenta Dental Care and Esthetic Center, Punjab, India

### ABSTRACT

**Introduction:** The great variance in soft-tissue drape of the human face complicates accurate assessment of the soft-tissue profile and it is a known fact that facial features of different ethnic groups differ significantly. This study was undertaken to establish soft tissue norms for Himachali ethnic population. **Method:** The sample comprised lateral cephalograms taken in natural head position of 100 normal subjects (50 males, 50 females). The cephalograms were analyzed by Arnett soft tissue cephalometric analysis for orthodontic diagnosis and treatment planning. The Student t test was used to compare the means of the 2 groups. **Results:** Statistically significant differences were found between Himachali males and females in certain key parameters. Males have thicker soft-tissue structures than females. Whereas females have greater interlabial gap when compared with Himachali males. When compared with other ethnic groups, Himachali subjects have thicker soft tissue structures. **Conclusions:** Statistically significant differences were found between Himachali males and females in certain key parameters. Differences were also noted between other ethnic groups and Himachali faces.

**Keywords:** Soft tissue, Himachali population, TVL, STCA.

### INTRODUCTION

According to Angle "The mouth is a most potent factor in making or marrying the beauty and character of the face". The modern society considers facial attractiveness as an important physical attribute. In 1982 Ricketts found numerous examples of divine proportion in the faces of commercial models, well aligned dental arches and in measurements of both frontal and lateral head cephalographs, suggesting that esthetics can indeed be analyzed scientifically.<sup>1</sup> Since the inception of Orthodontics as a specialty; orthodontists have been interested with measurements. The greatest trust in this direction, evolved with the introduction of Cephalometry by Broadbent in 1931 and

its application to clinical orthodontics.<sup>2</sup> Facial harmony and balance are determined by the facial skeleton and its overlying soft tissue structure. The methodology of cephalometric radiography led to the development of numerous cephalometric studies dealing with norms which provide useful guidelines in orthodontic diagnosis and treatment planning. Diagnosis by hard tissue cephalometric norms is unreliable.<sup>3</sup>

These cephalometric analyses concentrate mainly on the measurement of hard tissue structures, which are not constantly related to the soft tissue of the face. However these cephalometric analyses did not give proper importance to the soft tissue mid-face landmarks.

#### Corresponding Author:

Isha Aggarwal

E-mail:

isha\_ggw126@yahoo.com

Received: 2<sup>nd</sup> October 2016

Accepted: 17<sup>th</sup> November 2016

Online: 20<sup>th</sup> January 2017

To overcome disadvantages of the hard tissue cephalometric analysis soft tissue cephalometrics came into existence. The advantages of these analysis is that it provides the ability to make objective measurements of important structures and relationships. In the past, a few soft tissue cephalometric analyses were developed to measure facial positions.<sup>4,5,6</sup> These early soft tissue analyses were not combined with clinical assessment, and none of them examined all of the important facial components.

Dr. G.W. Arnett improved facial balance, beauty diagnosis and treatment planning by means of a combination of clinical facial analyses and Soft Tissue Cephalometrics.<sup>7</sup> It correlates various soft and hard tissue structures which determine balance and harmony as well as to a true vertical line in both saggital and vertical planes. The other important advantage of this analysis is that it is based on Natural Head Position. The analysis has proved useful in planning strategies for both orthodontic and Orthognathic surgery treatment.<sup>3</sup>

Since lip and chin form an important component of the oro-facial soft tissue profile so they play an important role in orthodontic diagnosis and treatment planning. It is a known fact that facial features of different ethnic groups differ significantly.<sup>8</sup> The norms in the Arnett's analysis were given for the white population.<sup>7</sup> Therefore it is essential that norms established for individual ethnic groups instead of relying on norms established for the Western population.<sup>8,9,10,11,12</sup> So this study was aimed to develop Arnett's Soft Tissue Cephalometric norms for lip and chin parameters for Himachali Ethnic Population.

**AIMS AND OBJECTIVES**

- 1) To identify possible soft tissue differences between Himachali males and females.
- 2) To compare the Himachali soft tissue norms with the actual norms of Arnett's soft tissue.
- 3) To compare the Himachali soft tissue norms with other ethnic populations.

**MATERIALS AND METHOD**

This study included a sample size of hundred

subjects (50 males and 50 females), selected from the Himachali Ethnic population which were judged to have well-balanced facial profiles from a panel of orthodontist.

1. All had natural Class I occlusions.
2. No history of trauma or craniofacial disorder, such as cleft palate.
3. No history of orthodontic treatment
4. Full complement of teeth.

The subjects were first assessed clinically in natural head position, with seated condyles and passive lips. Metallic markers were placed on various soft-tissue structures on the faces to study and relate them to the True Vertical Line as described by Arnett et al.<sup>7</sup> All lateral cephalometric head films were recorded by the same operator. They were then traced on a transparent cellulose acetate sheet. All reference points were first identified, located, and marked. The True Vertical Line was then established. This line was drawn through subnasale and was perpendicular to the natural horizontal head position. An Arnett et al<sup>7</sup> soft tissue cephalometric analysis was used to diagnose the subjects for the following parameters:

1. Upper lip thickness (mm) (Figure 1)
2. Lower lip thickness (mm) (Figure 1)
3. Pogonion–pogonion' (mm) (Figure 1)
4. Menton–menton' (mm) (Figure 1)
5. Upper lip length (mm) (Figure 2)
6. Lower lip length (mm) (Figure 2)
7. Interlabial gap (mm) (Figure 2)

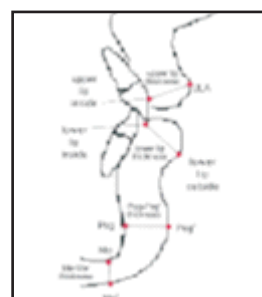


Figure 1

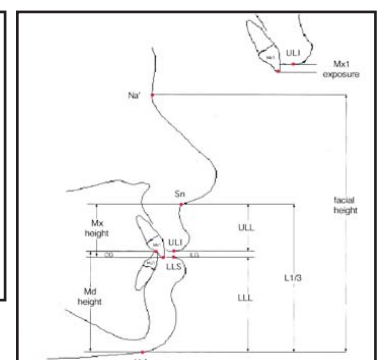


Figure 2

## RESULTS

The results were statistically analyzed to establish norms for the local population as well as to compare them with the findings of other studies. Normal values were calculated as mean, SD for reference in the treatment procedure. Significance of the difference between the male and female samples was tested with the Student *t* test. The parameters for Soft-tissue thickness (**Table 1**) showed that Himachali males have greater soft-tissue thickness than Himachali females. They have greater lower lip length than the females. The females had greater interlabial gap and maxillary incisor exposure than the males, these measurements were statistically significant.

Table1: Soft Tissue Thickness Himachali males and females

PARAMETERS	MALES		FEMALES		P VALUE
	MEAN	SD	MEAN	SD	
Upper lip thickness (mm)	15.600	2.3171	13.710	1.4746	<.0001**
Lower lip thickness (mm)	14.776	1.6648	13.610	1.6297	<.0001**
Pogonion-Pogonion' (mm)	14.020	2.4387	13.257	1.9716	.090*
Menton- Menton' (mm)	10.143	2.4774	8.478	1.5425	<.0001**
Upper lip length (mm)	21.290	1.8464	21.606	2.4152	.464
Interlabial gap (mm)	2.332	.8686	2.850	1.0510	.008**
Lower lip length (mm)	53.780	3.6001	49.850	4.1763	<.0001**

## DISCUSSION

Soft tissues like lips and the chin of an individual are closely related to the dentition and are being partially composed of the muscles therefore they have a functional influence on the underlying dental structures. According to Subtelny,<sup>13</sup> the vermilion aspect of the lips tends to maintain a close postural relationship to their supporting structures. The most dramatic changes in the facial appearance seem to be correlated with cases exhibiting lip protrusions whether it is one or both the lips. With the lips forming a very important part of the face, modifications in this area can

have a dramatic influence on the facial appearance. With lot of emphasis given on the cephalometric analysis, it is essential to know ethnically specific lip features of the group an orthodontist usually treats.

In the Soft Tissue measurements significant differences were found between the sexes (**Table 1**). Males have higher values for upper lip thicknesses ( $15.66 \pm 2.317$ ) and lower lip thickness ( $13.710 \pm 1.474$ ), soft tissue Pogonion ( $14.020 \pm 2.438$ ) and Menton ( $10.143 \pm 2.477$ ) thickness when compared with females. The difference in male and female lip thickness will have to be considered while planning the amount of incisor retraction for improving esthetics. This suggests that Himachali males have thicker soft tissue structures. This is in accordance with the study conducted by Anmol S Kalha et al,<sup>14</sup> Arnett et al<sup>7</sup> Uysal et al,<sup>15</sup> Lalitha and Kumar<sup>16</sup> and Zainab<sup>17</sup>

In the Facial Length measurements the parameters measured showed statistically significant differences between the sexes (**Table 1**). lower lip length ( $53.780 \pm 3.60$ ), was greater in males than in females. This is in accordance with the study conducted by Scheidman et al<sup>18</sup> who also reported increased lower facial height in male subjects because of increased lower lip length (LLs-Me'). These significant differences in facial heights between males and females might be significant in treatment planning. Females had a greater interlabial gap ( $2.850 \pm 1.051$ ) than did the males. This is because of short upper and lower lip lengths in Himachali females than in males. This is in accordance with the study conducted by Anmol S Kalha et al,<sup>14</sup> Arnett et al<sup>7</sup> and Ch. Lalitha and K.G. Gopa Kuma.<sup>16</sup> Whereas Uysal et al<sup>15</sup> finding is not in accordance with this.

In the Soft Tissue Thickness measurements when Himachali population was compared with the Caucasian (**Table 2a, 2b**) and South Indian population (**Table 3,4**) the mean and standard deviations of upper lip thickness, lower lip thickness, soft tissue thickness at chin for Himachali males and females were found to be greater. Though the results are not significant

Table 2a: Comparison between Himachali males and Arnett males

PARAMETERS	HIMACHALI MALES		ARNETT FEMALES		P VALUE
	MEAN	SD	MEAN	SD	
Upper lip thickness(mm)	15.600	2.3171	14.8000	1.4000	.032*
Lower lip thickness(mm)	14.776	1.6648	15.1000	1.2000	.179
Pogonion-Pogonion'(mm)	14.020	2.4387	13.5000	2.3000	.142
Menton-Menton'(mm)	10.143	2.4474	8.8000	1.3000	<.0001**
Upper lip length(mm)	21.291	1.846	24.4000	2.5000	.087
Interlabial gap(mm)	2.340	1.0947	2.4000	2.5000	.087
Lower lip length(mm)	53.780	3.6001	54.3000	2.4000	.312

Table 2b: Comparison between Himachali females and Arnett females

PARAMETERS	HIMACHALI FEMALES		ARNETT FEMALES		P VALUE
	MEAN	SD	MEAN	SD	
Upper lip thickness(mm)	13.710	1.4746	12.6000	1.8000	<.0001**
Lower lip thickness(mm)	13.610	1.6297	13.6000	1.4000	.966
Pogonion-Pogonion'(mm)	13.257	1.9716	11.8000	1.5000	0.196
Menton-Menton'(mm)	8.478	1.5425	7.4000	1.6000	.322
Upper lip length(mm)	21.606	2.415	21.0000	1.9000	.236
Interlabial gap(mm)	2.850	1.051	3.3000	1.3000	<.0001**
Lower lip length(mm)	49.850	4.1763	46.9000	2.3000	<.0001**

Table 3: Comparison between Himachali males and South Indian males

PARAMETERS	HIMACHALI MALES		SOUTH INDIAN MALES		P VALUE
	MEAN	SD	MEAN	SD	
Upper lip thickness(mm)	15.600	2.3171	13.5800	2.7200	.110
Lower lip thickness(mm)	14.776	1.6648	14.8000	2.4300	.918
Pogonion-Pogonion'(mm)	14.020	2.4387	13.4500	2.5200	.108
Menton-Menton'(mm)	10.143	2.4474	8.9300	2.0500	.001
Upper lip length(mm)	21.290	1.8464	22.3300	3.5700	<.0001**
Interlabial gap(mm)	2.332	.8686	0.15	0.48	<.0001**
Lower lip length(mm)	53.780	3.6001	48.82	7.15	<.0001**

Table 4: Comparison between Himachali females and South Indian Females

PARAMETERS	HIMACHALI FEMALES		SOUTH INDIAN FEMALES		P VALUE
	MEAN	SD	MEAN	SD	
Upper lip thickness(mm)	13.710	1.4746	12.1300	2.0100	<.0001**
Lower lip thickness(mm)	13.610	1.6297	13.0300	1.5600	.015*
Pogonion-Pogonion'(mm)	13.257	1.9716	11.0300	1.7800	<.0001**
Menton-Menton'(mm)	8.478	1.5425	7.2800	2.3800	.273
Upper lip length(mm)	21.606	2.4152	19.6200	3.7700	.112
Interlabial gap(mm)	2.850	1.0510	1.20	1.56	<.0001**
Lower lip length(mm)	49.850	4.1763	41.13	9.65	<.0001**

Table 5: Comparison between Himachali males and Andhra males

PARAMETERS	HIMACHALI MALES		ANDHRA MALES		P VALUE
	MEAN	SD	MEAN	SD	
Upper lip thickness(mm)	15.600	2.3171	14.6833	2.4122	.208
Lower lip thickness(mm)	14.776	1.6648	17.8833	2.2541	<.0001**
Pogonion-Pogonion'(mm)	14.020	2.4387	14.2500	2.3295	.513
Menton-Menton'(mm)	10.143	2.4474	9.5167	1.8075	.080
Upper lip length(mm)	21.290	1.8464	22.0000	2.0886	<.0001**
Interlabial gap(mm)	2.332	.8686	3.2500	0.9804	.002
Lower lip length(mm)	53.780	3.6001	48.6333	3.7461	<.0001**

Table 6: Comparison between Himachali females and Andhra Females

PARAMETERS	HIMACHALI FEMALES		ANDHRA FEMALES		P VALUE
	MEAN	SD	MEAN	SD	
Upper lip thickness(mm)	13.710	1.4746	11.9000	1.7440	<.0001**
Lower lip thickness(mm)	13.610	1.6297	15.8667	1.7760	<.0001**
Pogonion-Pogonion'(mm)	13.257	1.9716	12.6333	2.2778	.179
Menton-Menton'(mm)	8.478	1.5425	7.9167	1.5707	.238
Upper lip length(mm)	21.606	2.4152	20.7333	2.1645	.244
Interlabial gap(mm)	2.850	1.0510	2.8500	0.8525	.548
Lower lip length(mm)	49.850	4.1763	44.5000	3.1486	<.0001**

clinically but the values are higher in Himachali population. This suggests that Caucasian and South Indian population have thinner soft tissue drape. When comparisons were made with the Andhra population (**Table 5,6**) the mean and standard deviations of upper lip thickness was found to be higher in Himachali males and females when compared to Andhra males and females whereas lower lip thickness was found to be higher in Andhra males ( $17.8833 \pm 2.2541$ ) and females ( $15.8667 \pm 1.7760$ ) when compared with Himachali males ( $14.776 \pm 1.66$ ) and females ( $13.610 \pm 1.62$ ).

When the comparison of mean Facial Lengths of the Himachali population was done with the Caucasian population (**Table 2.a, 2.b**), south Indian population (**Table 3,4**) and Andhra population (**Table 5,6**) it suggested shorter facial lengths in Himachali

males and an increase in Himachali females. The difference in facial heights between males and females might be significant in treatment planning because these differences can be indications to increase or decrease facial height. This study emphasizes the importance of the lips in treatment planning, especially where intrusion or retraction of incisors is planned. Soft tissue camouflage is the nature's way of treating malocclusion and this should be considered and respected when planning for orthodontic treatment. The sexual differences are due to the influence of the sex hormones on the facial contour, which become very evident by adolescence. The male bony structure is bolder and more prominent, with dominance of the forehead, nose, chin, and stronger contour of the mandible.<sup>19</sup> This comes with the general trend of males



having greater measurements than females. This is because males have growth period than females.<sup>13,20,21</sup>

## CONCLUSIONS

Based on the present study it was concluded that statistically significant differences were found between the subjects of Himachali ethnic population and the other populations and also between the males and females of Himachali ethnic population.

- 1) Himachali Males have thicker soft-tissue structures, whereas females have greater interlabial gap.
- 2) The comparison between Himachali population and Caucasian population suggested that Himachali population had increased soft tissue thicknesses, decreased facial heights.
- 3) The comparison between Himachali population and South Indian population suggested that Himachali population had increased soft tissue thicknesses, increased facial heights.
- 4) The comparison between Himachali population and Andhra population suggested that Himachali population had increased upper lip thickness, Facial heights.

The difference in soft tissue parameters in different ethnic groups shows the importance of what is optimal for a particular group. In the Caucasian population, straight profile with a prominent chin is considered normal and esthetic, whereas mild convexity in the Indian scenario is considered normal.

## BIBLIOGRAPHY

1. Ricketts Robert M. The biologic significance of the divine proportion and Fibonacci series. *Am J Orthod Dentofacial Orthop* May 1982;351-370.
2. Broadbent Holly B. A new X-Ray technique and its application to orthodontia. *Angle Orthod* 1931; 01:45-66.(4)
3. Arnett G. W. Facial planning for orthodontists and oral surgeons. *Am J Orthod Dentofacial Orthop*; 126;3: 290-295(5)
4. Holdaway R.A. A soft-tissue cephalometric analysis and its use in orthodontic treatment planning - Part I. *Am J Orthod Dentofacial Orthop* 1983;84:1-28.(11)
5. Holdaway R.A. A soft-tissue cephalometric analysis and its use in orthodontic treatment planning - Part II. *Am J Orthod Dentofacial Orthop* 1984; 85: 279-293.(12)
6. Legan H.L., Burstone C.J. Soft tissue cephalometric analysis for Orthognathic surgery. *J Oral Surg* 1980; 38:744-51.
7. Arnett G.W., Jelic J.S., Kim J., Cummings D.R., Beress A., Worley M. Jr. Soft tissue cephalometric analysis: diagnosis and treatment planning of dentofacial deformity. *Am J of Orthod Dentofacial Orthop* 1999; 116:239-253
8. Cotton WN, Takano WS, Wong WM. The Downs analysis applied to three other ethnic groups. *Angle Orthod* 1951;21:213-20.
9. Fonseca RJ, Klein WD. A cephalometric evaluation of American Negro women. *Am J Orthod* 1978;73:152-60.
10. Hwang HS, Kim WS, McNamara JA. Ethnic differences in the soft tissue profile of Korean and European-American adults with normal occlusion and well-balanced faces. *Angle Orthod* 2002; 72:72-80.
11. Nanda R, Nanda RS. Cephalometric study of the dentofacial complex of North Indians. *Angle Orthod* 1969;39:22-8.
12. Uesato G, Kinoshita Z, Kawamoto T, Koyama I, Nakanishi Y. Steiner cephalometric norms for Japanese and Japanese-Americans. *Am J Orthod* 1978;78:321-6.
13. Subtelny JD. The soft tissue profile, Growth and treatment changes. *Angle Orthod* 1961;31:105-22.
14. Kalha AS. Soft-tissue cephalometric norms in a South Indian ethnic population. *Am J Orthod Dentofacial Orthop* 2008;133:876-881.
15. Uysal T, Yagci A, Basciftci FA, Sisman Y. Standards of soft tissue Arnett analysis for surgical planning in Turkish adults. *Eur J Orthod* 2009;31:449-56.
16. Ch.Lalitha, K.G. Gopa Kumar. Assessment of Arnett soft tissue cephalometric norms in Indian (Andhra) population. *The Orthodontic cyber journal*, January 2010.
17. Zainab M, Al-Janabi MF. Soft-tissue cephalometric norms for a sample of Iraqi adults with class I normal occlusion in natural headposition. *J Bagh College Dentistry* 2011;23:161-6.
18. Scheideman GB, Bell WH, Legan HL, Finn RA, Reisch JS. Cephalometric analysis of dentofacial normal. *Am J Orthod* 1980; 78:404-20.
19. Powell N, Humphreys B, editors. Proportions of the aesthetic face. Thieme-Stratton; New York: 1984.
20. Trenouth MJ, Davies PHJ, Johnson JS. A statistical comparison of three sets of normative data from which to derive standards for craniofacial measurements. *Eur J Orthod* 1985;7:193-200.
21. Genecove JS, Sinclair PM, Dechow PC. Development of the nose and soft tissue profile. *Angle Orthod* 1990;60:191-8.

Source of Support: Nil, Conflict of Interest: None Declared