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Original Article

Arnett's Soft Tissue Cephalometric Norms For Himachali Ethnic Population

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ABSTRACT

Introduction: The modern society considers facial attractiveness as an important physical attribute. 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 norms for Himachali ethnic population. Methods: 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 and a more acute nasolabial angle than females. Males have longer faces, and females have greater interlabial gap and maxillary incisor exposure. Males have more deep-set facial structures than females. Compared with other ethnic groups, Himachali subjects have more deep-set midfacial structures and more protrusive dentitions. 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.

Introduction

Throughout recorded history and even earlier as evidenced by archaeological artifacts, human beings have been aware of and concerned about beauty and facial esthetics.[1] 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.[2] 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.

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[3]. 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.

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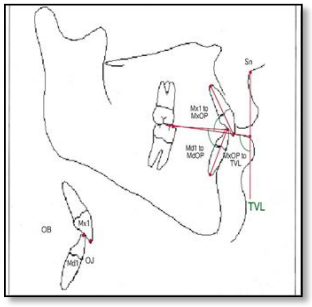


fig 1

- **Maxillary occlusal plane (Mx OP) to true vertical line (TVL)**
- **Maxillary central incisor tip (Mx1) to Maxillary occlusal plane (Mx OP)**
- **Mandibular incisor tip (Md1) to Mandibular occlusal plane (Md OP)**
- **Overjet (OJ)**
- **Overbite (OB)**

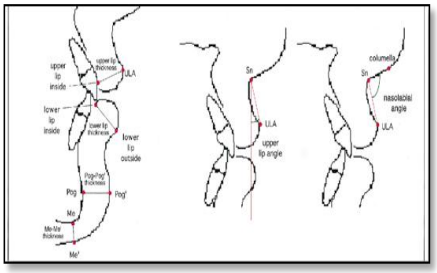


fig 2

- **Upper lip thickness (Upper Lip Anterior [ULA] to Upper Lip Inside [ULI])**
- **Lower lip thickness (Lower Lip anterior [LLA] to Lower Lip superior [LLS])**
- **Pogonion-Pogonion' (Pog – Pog')**
- **Menton-Menton' (Me – Me')**
- **Upper lip angle (Subnasale [Sn]-Upper Lip Anterior [ULA] to true vertical line [TVL])**
- **Nasolabial angle (Subnasale [Sn] - Upper Lip Anterior [ULA] to Subnasale [Sn] - Columella)**

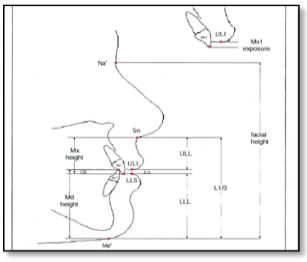


fig 3

- **Facial height (Nasion' [Na'] to Menton'[Me'])**
- **Upper lip length (Upper Lip Inferior [ULI] to Subnasale [Sn])**
- **Interlabial gap (ILG)**
- **Lower lip length (Lower lip Superior [LLS] to Menton' [Me'])**
- **Lower 1/3 of face (Subnasale [Sn] to Menton' [Me'])**
- **Overbite (OB)**
- **Maxillary incisor tip (Mx1) exposure**
- **Maxillary height (Subnasale [Sn] to tip of maxillary incisor tip [Mx1])**
- **Mandibular height (Menton' [Me'] to tip of mandibular incisor tip [Md1])**

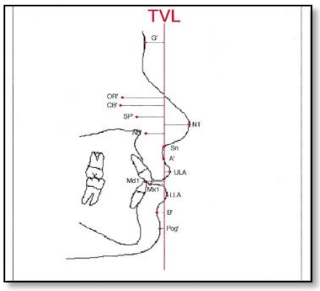


Fig 4

- **Glabella (G')**
- **Orbital rims (OR')**
- **Cheek bone (CB')**
- **Subpupil (SP')**
- **Alar base (AB')**
- **Nasal projection**
- **Subnasale (Sn)**
- **A' point**
- **Upper lip anterior (ULA)**
- **Maxillary Incisor tip (Mx1)**
- **Mandibular Incisor tip (Md1)**
- **Lower lip anterior (LLA)**
- **B' point**
- **Pogonion' (Pog')**

Diagnosis by hard tissue cephalometric norms is unreliable[4] . These cephalometric analysis concentrate mainly on the measurement of hard tissue structures, which are not constantly related to the soft tissue of the face.

Another method of diagnosis emerged which was based on direct facial examination and diagnosis[5,6]. This clinical examination is 3-dimensional and is most useful for showing shapes and contours. It is, however, subjective. The advantage of soft tissue cephalometrics is that it provides the ability to make objective measurements of important structures and relationships. In the past, a few soft tissue cephalometric analysis were developed to measure facial positions[7,8,9]. These early soft tissue analysis 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 analysis and Soft Tissue Cephalometrics[10]. It provides normal values,

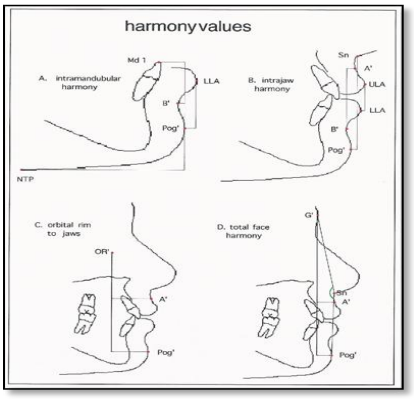


fig 5

- **Intramandibular relations**
  - **1. Mandibular incisor tip (Md1) to Pogonion' (Pog')**
  - **2. Lower lip anterior (LLA) to Pogonion' (Pog')**
  - **3. B' point (B') to Pogonion' (Pog')**
  - **4. Throat length (NTP to Pog')**
- **Interjaw relations**
  - **1. Subnasale' (Sn') to Pogonion' (Pog')**
  - **2. A' point (A') to B' point (B')**
  - **3. Upper lip anterior (ULA) to lower lip anterior (LLA)**
- **Orbit to jaws**
  - **1. Orbital rim' (Or') to A' point (A')**
  - **2. Orbital rim' (Or') to Pogonion' (Pog')**
- **Full facial balance**
  - **1. Facial angle (Glabella' [G'] to Subnasale [Sn] to pogonion' [Pog'])**
  - **2. Glabella' (G') to A' point (A')**
  - **3. Glabella' (G') to Pogonion' (Pog')**

emphasizes soft tissue outcome, and lessens the emphasis of overjet as the sole indication of success[11]. 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.

The norms in the Arnett's analysis were given for the white population. It is a known fact that facial features of different ethnic groups differ significantly. Therefore it is essential that norms established for individual ethnic groups instead of relying on norms established for the Western population[12-16]. So this study was aimed to develop Arnett's Soft Tissue Cephalometric norms for Himachali Ethnic Population.

Aims and Objectives

1)To establish lateral cephalometric norms of Arnett's soft tissue cephalometric analysis for Himachali Ethnic population.

2)To identify possible soft tissue differences between young adult men and women.

3)To compare the Indian norms with the actual norms of Arnett's soft tissue.

4)To compare the Himachali norms with other ethnic populations.

Materials and Methods

The studies included a sample size of hundred subjects (50 males and 50 females), selected from the Himachali Ethnic population and were judged to have well-balanced facial profiles froma panel of orthodontist. All had natural Class I occlusions, No history of trauma, No history of orthodontic treatment and 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[10]. A lateral head film was obtained with the subject in natural head position, with seated condyle and with passive lips. The Natural Head Position was recorded based on the method proposed by Cooke and Wei[17]. All lateral cephalometric 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 subnasal and was perpendicular to the natural horizontal head position. Structures to the right of the True Vertical Line were given a positive sign and those to the left were

given a negative sign. The soft tissue cephalometric parameters were divided into five groups: dentoskeletal factors (Fig 1),soft tissue structures (fig 2), facial lengths (fig 3), projections to TVL (Fig 4), harmony values (Fig 5).

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. Statistical analysis showed that the sexes were similar in some but not in all measurements. In dentoskeletal factors (Table I), only the maxillary central incisor to occlusal plane to TVL showed a significant higher value in the females. The remaining means were not statistically different between the sexes. Soft-tissue measurements (Table I) showed that males have greater soft-tissue thickness than females and also more acute nasolabial angles (98.72°) than females. Facial length measurements (Table I) showed that male faces were statistically longer (Nasion' to Menton', 132.36) than female faces (127.81). The females had greater interlabial gap and maxillary incisor exposure than the males; these measurements were statistically significant. In the projections to TVL (Table I) statistically significant differences were seen in the midface and the lower third structures of the face between the sexes. The measurements of cheekbone, orbital rim , subpupil, and alar base to TVL were higher in the males. Also, nasal projection was higher in the males (15.17 mm) compared with the females (13.43 mm). In the lower third of the face, the males had more protrusive lips (upper-lip anterior, 2.08 mm; lower-lip anterior, -2.112 mm), whereas the females had more proclined dentitions. The facial harmony values (Table I) were statistically similar for all except for mandibular incisor to soft-tissue pogonion, soft-tissue B-point to soft-tissue pogonion, orbital rim to soft tissue point A and orbital rim to soft tissue pogonion which were higher in males than in females.

Discussion

In the Dentoskeletal Factor measurements the mean maxillary occlusal plane to True Vertical Line for Himachali male was ($93.40^0 \pm 3.35$) and for females was ($96.94^0 \pm 3.97$). The difference between these two values was statistically significant. This might indicate that females have a steeper occlusal plane. This is in accordance with the study conducted by Ch. Lalitha and K.G. Gopa Kumar[18] on Local Andhra Population. All remaining parameters measured did not show statically significant differences between the sexes.

In the Soft Tissue measurements significant differences were found between the sexes. Males have higher values for both upper lip thicknesses (15.66 ± 2.317) and lower lip thickness (13.710 ± 1.474) , soft tissue Pogonion (14.020 ± 2.438) and Menton (10.143 ± 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[19] and Arnett et al[10].

In the Facial Length measurements the parameters measured showed statistically significant differences between the sexes. Facial height (132.360 ± 3.94), lower lip length (53.780 ± 3.60), lower third of the face (75.050 ± 4.021), and mandibular height (54.89 ± 2.93) were greater in males than in females. Maxillary height was increased in females (25.230 ± 2.731) as compared

to males. This is in accordance with the study conducted by Scheidman et al[20] 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 ± 1.051) and maxillary incisor exposure (4.3200 ± 1.26) 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[19], Arnett et al[10] and Ch. Lalitha and K.G. Gopa Kumar[18].

In the projections to True Vertical Line measurements the mean values for the Orbital rim (-30.430 ± 3.04), Cheek bone (-45.320 ± 5.8465), Subpupil (-24.252 ± 2.5777), alar base (- 15.880 ± 1.944), Maxillary incisor (-14.472 ± 5.7222) and Mandibular incisor (-18.760 ± 3.5445) to true vertical line showed statistically significant differences between males and females. The values for mid facial structures were more negative to True vertical line in males. This indicates that males had more retruded or deep set mid facial structures. The nasal projection (15.172 ± 2.1385) in males was higher as compared to females. This is in accordance to the study conducted by Scheidman et al[20], Anmol S Kalha et al[19], Arnett et al[10] and Ch. Lalitha and K.G. Gopa Kumar[18].

In the lower third of the face, females had more proclined maxillary and mandibular anterior teeth as shown by the maxillary (-12.680 ± 2.6912) and mandibular (-15.680 ± 2.5550) central incisors to true vertical line. This is because of thicker soft tissue structures in males. In a study of dentofacially normal white subject, Scheidman et al[20] reported that maxillary lips were slightly anterior, the mandibular lips was just posterior and the chin was 4.5 to 4.2 mm posterior to True Vertical Line in male and female subjects. The differences between the mean values of soft tissue B point and pogonion to True Vertical Line did not show statistically significant differences between the sexes. The nasolabial angle was more acute in males (98.72 ± 14.682) as compared to females (104.14 ± 14.682) this is because of thicker soft tissue structures in males. This is in accordance with the study conducted by Anmol S Kalha[19] and Ch. Lalitha, K.G. Gopa Kumar[18].

In the Facial Harmony measurements in intramandibular relationships, there was statistically significant increase in mean values for mandibular central incisor to soft tissue pogonion' (15.020 ± 9.6769) and soft tissue B point' to soft tissue pogonion' (5.110 ± 3.7106) in males. This indicated that mandibular incisors are more upright in males as compared to females.also the values for Orbital rim to soft tissue point A and Orbital rim to soft tissue pogonion were found to be higher in males than females.

The mean facial angle of the males (163.19 ± 7.127) was higher than that of females (161.79 ± 6.877) suggesting that females have more convex profiles. Though the result may not be clinically significant but the values are more higher in males than females. These values are in accordance with the study conducted by Legan and Burnstone[9], Scheidman et al[20].

In the Dentoskeletal Factors measurements the Himachali population had less proclination of mandibular and maxillary incisors when compared with Caucasian population (Table II,III) which may be due to ethnic variations. Maxillary occlusal planes in Caucasian males (95.00 ± 1.4) were steeper as compared with the Himachali males (93.4000 ± 3.53).When the Himachali population was compared with the South Indian population (Table IV,V) the Dentoskeletal Factors

measurements showed that in Himachali population Maxillary occlusal plane in Himachali males (93.4000 ± 3.35) and females (96.94 ± 3.97) was steeper as compared to South Indian males (91.50 ± 7.93) and females (85.6 ± 8.64).When the comparison was made with the Andhra population (Table VI.VII) the Dentoskeletal Factors measurements showed that the Himachali population had less proclination of mandibular and maxillary incisors for both the sexes. This is possible due to ethnic reasons[21]. Maxillary occlusal plane was found to be steeper in Andhra males (98.66 ± 5.01) and females (99.33 ± 6.21) when compared with the Himachali males (93.4000 ± 3.53) and females (96.94 ± 3.97).

In the Soft Tissue Thickness measurements when Himachali population was compared with the Caucasian (Table II,III) and South Indian population (Table IV,V), 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 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 VI,VII), 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 ± 2.2541) and females (15.8667 ± 1.7760) when compared with Himachali males (14.776 ± 1.66) and females (13.610 ± 1.62).

When the comparison of mean Facial Lengths of the Himachali population was done with the Caucasian population (Table II,III),south Indian population (table VI.V)and Andhra population (Table VI,VII) 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.

In the projections to the True Vertical Line the mean values of orbital rim, cheekbone, subpupil, alar base, and glabella were found to be higher in Himachali males and females when compared with Caucasian (Table II, III), South Indian (Table IV,V) and Andhra population (Table VI,VII). It suggests more retruded and deep set midface structures in Himachali males and females. The nasal projection values were higher in Caucasian females when compared to the Himachali females . These findings also suggest that maxillary and mandibular incisors in both the sexes of the Himachali population are more upright when compared with the Caucasian population. The nasal projection values were higher in south Indian when compared with Himachali population. This suggests that maxillary and mandibular incisors in both the sexes of Himachali population are more upright when compared with the South Indian males and females. When comparisons were made with the Andhra population the nasal projection values were higher in Andhra Population. These findings also suggest that maxillary and mandibular incisors in both the sexes of the Himachali population are more upright when compared with the Andhra males and females. When comparisons of other parameters (Point A, Upper Lip Anterior, Mx1, Md1, Lower Lip Anterior, Point B) were done with other population it suggested that Himachali population had had upright & thin upper & lower lips, retruded incisors, point B & Pogonion.

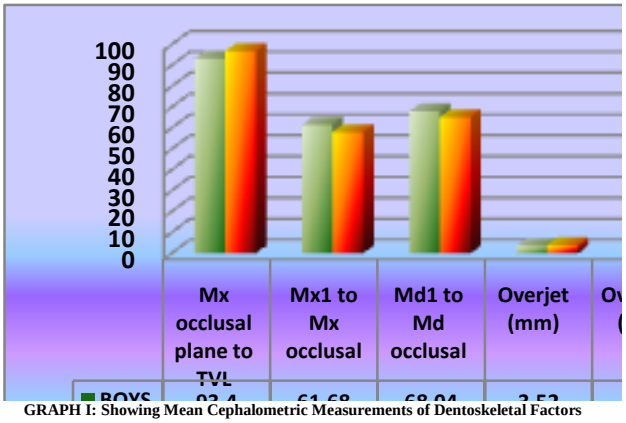
In Facial Harmony measurements the mean values of facial harmony in the intramandibular relationships of the mandibular central incisor to pogonion, B point' to

pogonion' were found to be more in Himachali population when compared with the Caucasian (Table II,III), South Indian (Table IV,V) and Andhra population (Table VI.VII). This indicates that Caucasians, South Indian and Andhra population have more proclined teeth. The neck throat length was found to be less in case of Himachali population in both the sexes when compared with the Caucasian, South Indian and Andhra population. A comparison of mean interjaw relationship of facial harmony showed that all values for both the sexes were increased in the Himachali population when compared with the Caucasian and South Indian population except for certain parameters which were less in Himachali females when compares with South Indian females (ULA-LLA, Or'-A, Or' – Pog'). The mean facial angle for both the sexes in Himachali population is lower than that of the Caucasian, South Indian and Andhra population indicating that Himachali population has more convex profile compared with the Caucasian, South Indian and Andhra population. The mean lower lip anterior in Himachali population is lower than those of the South Indian and Andhra population suggesting recessive chins in the South Indian and Andhra Sample.

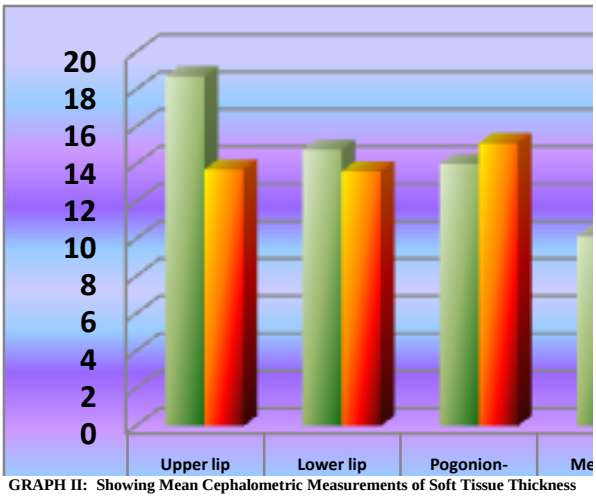
Conclusions

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

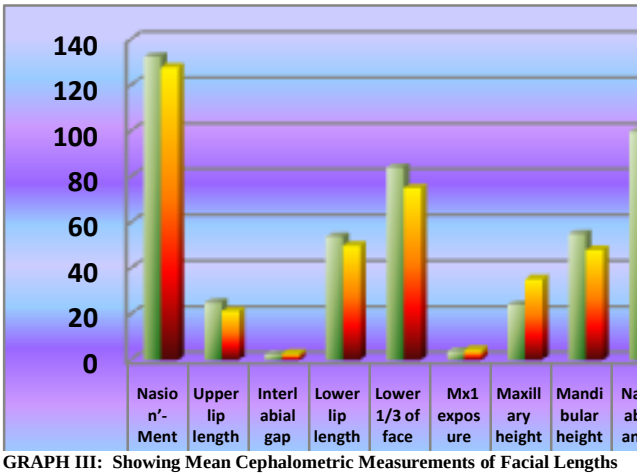
1) Males have a flatter occlusal plane, thicker soft-tissue structures, acute nasolabial angles, longer faces and more deep-set facial structures when compared with females, whereas females have greater interlabial gap and maxillary incisor exposure and convex profile than males.
2) The comparison between Himachali population and Caucasian population suggested that Himachali population had increased soft tissue thicknesses, decreased facial heights, midface deficiency, flatter occlusal plane and more convex profile.
3) The comparison between Himachali population and South Indian population suggested that Himachali population had increased soft tissue thicknesses, midface deficiency, increased facial heights and more convex profile.
4) The comparison between Himachali population and Andhra population suggested that Himachali population had increased upper lip thickness, Facial heights, midface deficiency, flatter occlusal plane and more convex profile.



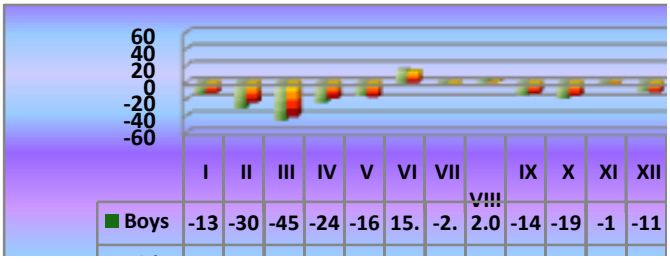
GRAPH I: Showing Mean Cephalometric Measurements of Dentoskeletal Factors



GRAPH II: Showing Mean Cephalometric Measurements of Soft Tissue Thickness



GRAPH III: Showing Mean Cephalometric Measurements of Facial Lengths and Heights

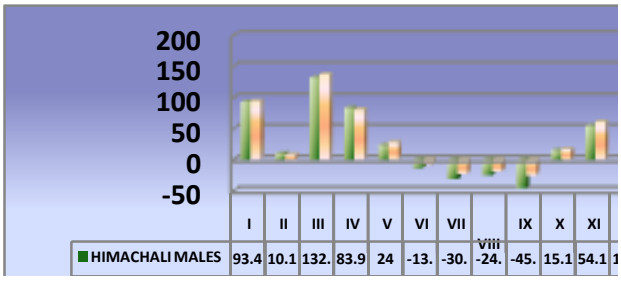


I. Glabella'	*IV. Subpupil*	*VII. A point'*	*X. Md1*	*XIII. Pogonion'*
II. Orbital rim	*V. Alar base*	*VIII. Upper lip anterior*	*XI. Lower lip anterior*	*XIV. Neck throat Length*
III.Cheek bone	*VI. Nasal projection*	*IX. Mx1*	*XII. B point'*	

GRAPH IV: Showing Mean Cephalometric Measurements of Projections to True Vertical Line

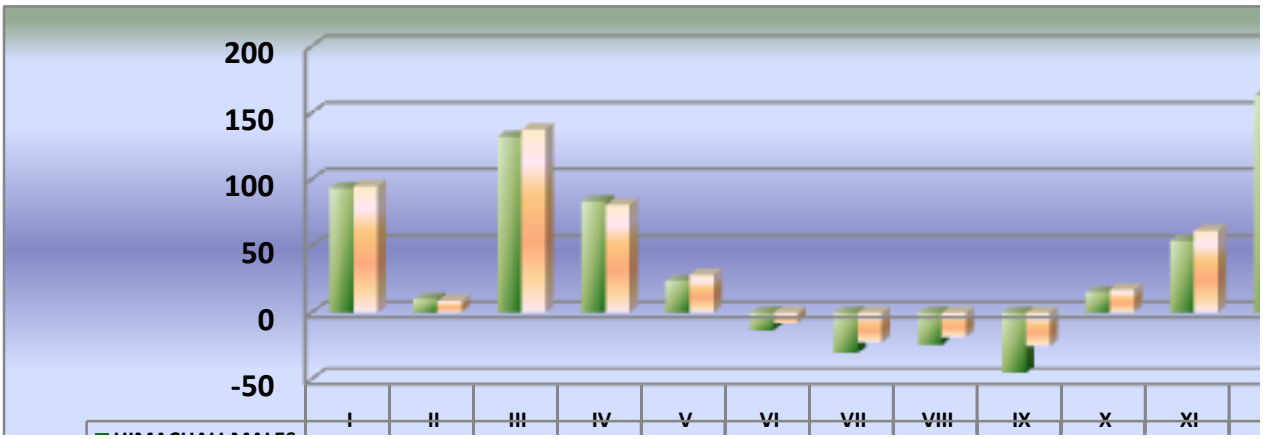
I. Mandibular Incisor – Pog'	IV. Subnasale'- Pog'	VII.Orbital Rim – A Point'	X. Glabella' – A Point'
II. Lower Lip Anterior – Pog'	V. A Point' – B Point'	VIII.Orbital Rim – Pog'	XI. Glabella' – Pog'
III. B Point' – Pog'	VI. Upper Lip Anterior – Lower Lip	IX.Facial Angle	

GRAPH V: Showing Mean Cephalometric Measurements of Facial Harmony.



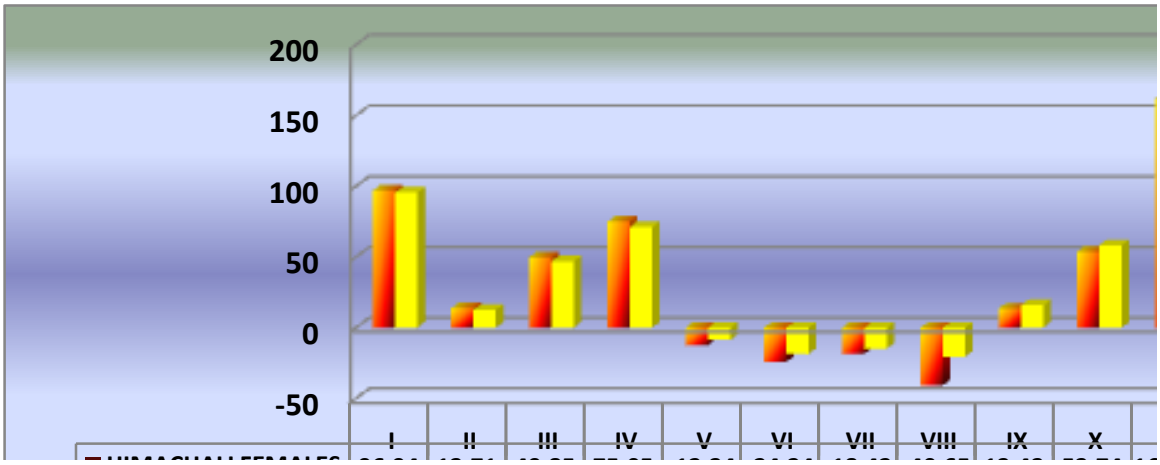
I. Mandibular Incisor – Pog'	*IV. Subnasale'- Pog'*	*VII. Orbital Rim – A Point'*	*X. Glabella' – A Point'*
II. Lower Lip Anterior – Pog'	*V. A Point' – B Point'*	*VIII. Orbital Rim – Pog'*	*XI. Glabella' – Pog'*
III. B Point' – Pog'	*VI. Upper Lip Anterior – Lower Lip*	*IX. Facial Angle*	

GRAPH V: Showing Mean Cephalometric Measurements of Facial Harmony.



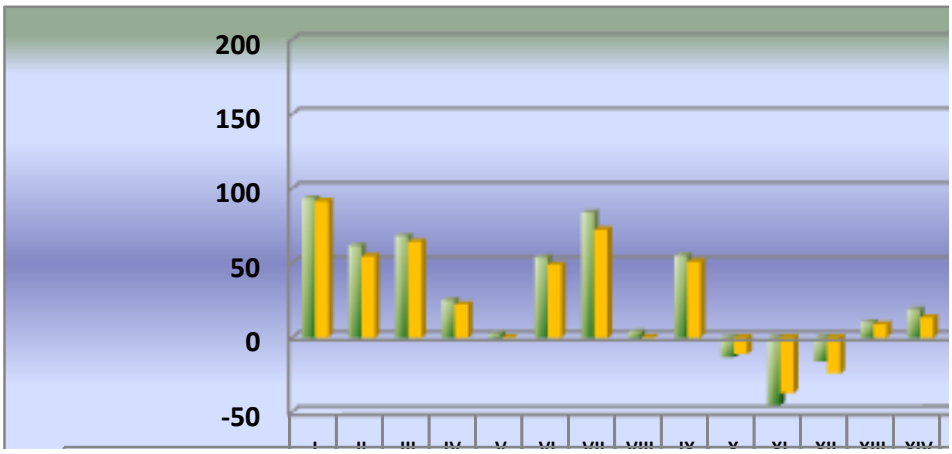
I. MxOP- TVL	IV. Lower 1/3rd face	VII. Orbital rim'	X. Nasal projection	XIII. upper lip thickness
II. Menton-Menton'	V. Maxillary height	VIII. Subpupil'	XI. Neck throat length	XIV. nasolabial angle
III. Nasion'-Menton'	VI. Glabella'	IX. Cheek bone	XII. Gb'_Sn'_Pog'	

Table VI: Showing comparison of Himachali Males with Arnett's value Males



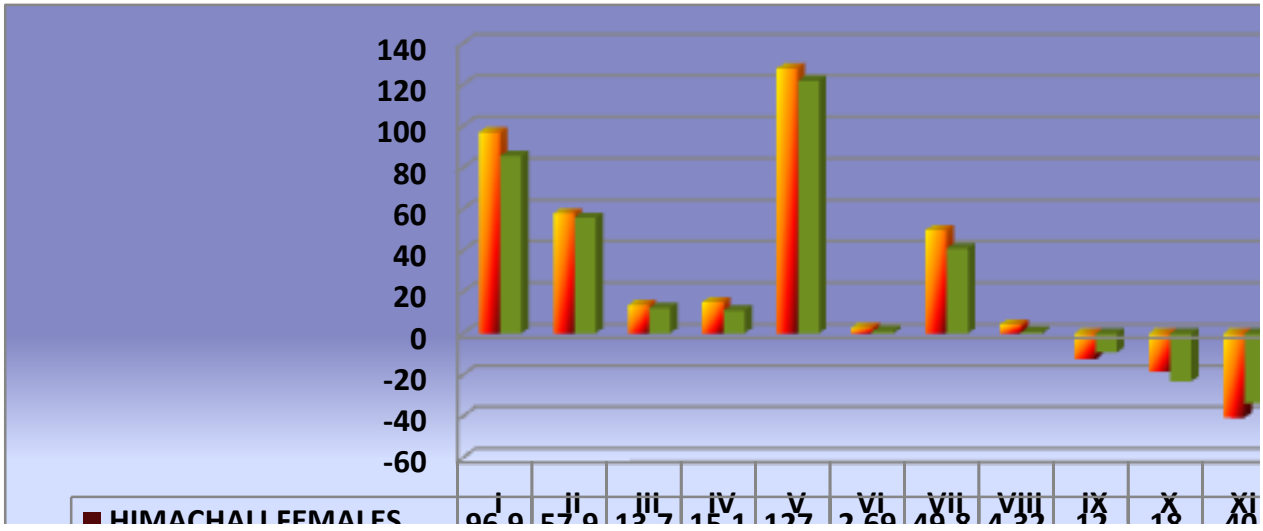
I. MxOP- TVL	IV. Lower 1/3rd face	VII. Subpupil'	X. Neck throat length	XIII. nasolabial angle
II. Upper lip thickness	V. Glabella'	VIII. Cheek bone	XI. Gb'_Sn'_Pog'	
III. Lower lip length	VI. Orbital rim'	IX. Nasal projection	XII. pogonion-pogonion'	

Table VII: Showing comparison of Himachali Females with Arnett's value Females.



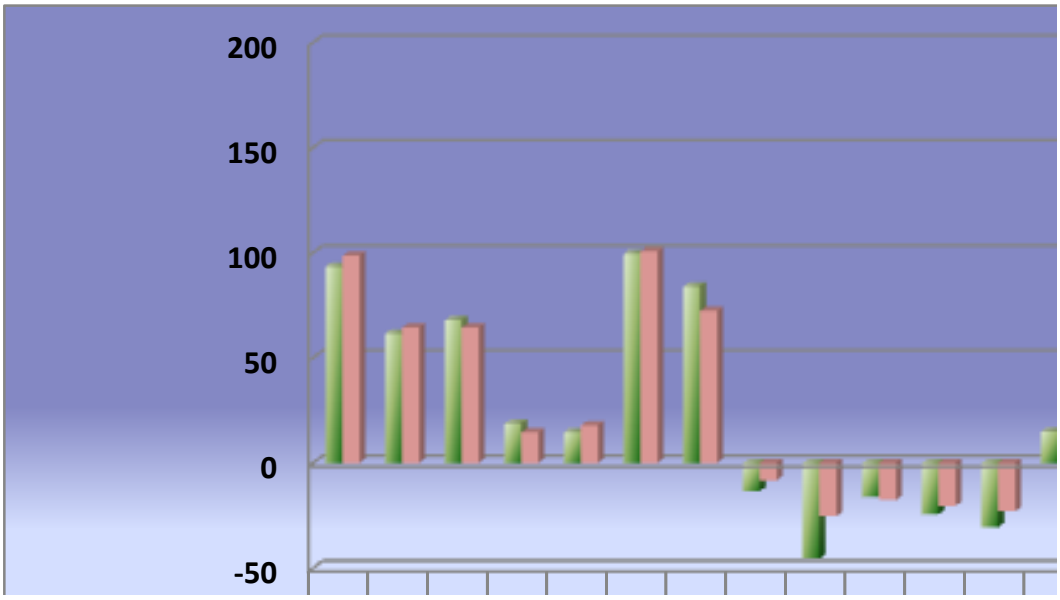
I.MxOP- TVL	IV. Upper lip length	VII. Lower 1/3rd face	X. Glabella'	XIII.menton-menton'	XVI. Md1-pog'
II. Mx1_MxOP	V. Interlabial gap	VIII. Mx1 exposure	XI. Cheek bone	XIV. upper lip thickness	XVII. B'point-pog'
III. Md1_MdOP	VI. Lower lip length	IX. Mandibular height	XII. Alar base	XV. nasolabial angle	XVIII. facial angle

Table VIII: Showing comparison of Himachali Males with South Indian males



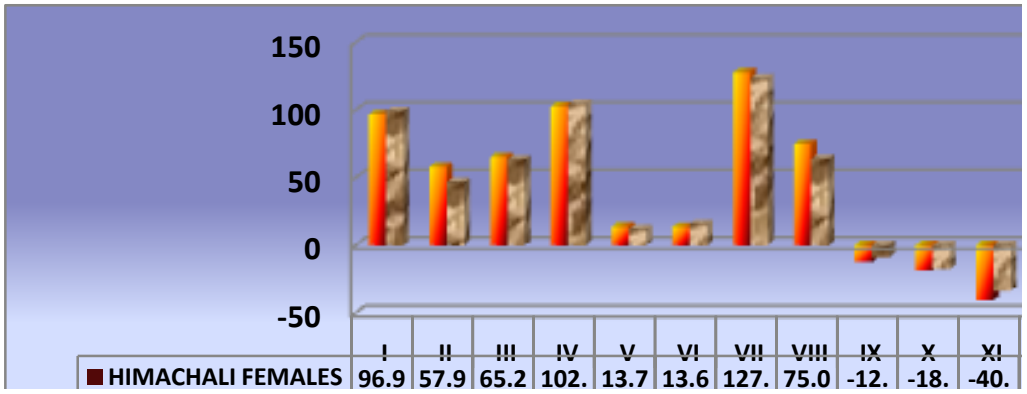
I.MxOP- TVL	IV. Pogonion-Pogonion'	VII. Lower lip length	X. Subpupil'	XIII. B'point-pog'
II. Mx1_MxOP	V. Nasion'-Menton'	VIII. Mx1 exposure	XI. Cheek bone	XIV. Neck throat length
III. Upper lip thickness	VI. Interlabial gap	IX. Glabella'	XII. Md1-pog'	

Table IX: Showing comparison of Himachali Females with South Indian Females.



I.MxOP- TVL	IV. Upper lip thickness	VII. Lower 1/3rd face	X. Alar base	XIII. Md1-pog'	XVI. Facial angle
II. Mx1_MxOP	V. Lower lip thickness	VIII. Glabella'	XI. Subpupil	XIV. B'point-pog'	
III. Md1_MdOP	VI. Nasolabial angle	IX. Cheek bone	XII. Orbital'	XV. Neck throat Length	

Table X: Showing comparison of Himachali males with Andhra males.



I.MxOP- TVL	IV. nasolabial angle	VII. Nasion'-Menton'	X. Subpupil'	XIII. Orbital rim'
II. Mx1_MxOP	V. Upper lip thickness	VIII. Lower 1/3rd face	XI. Cheek bone	XIV. Nasal Projection
III. Md1-MdOP	VI. Lower lip thickness	IX. Glabella'	XII. Alar base	

Table XI: Showing comparison of Himachali Females with Andhra Females.

TABLE-I Comparison between Himachali males and Himachali females

	MALES		FEMALES		
MEASUREMENTS	**MEAN**	**SD**	**MEAN**	**SD**	**P VALUE**
DENTOSKELETAL FACTORS					
Mx occlusal plane to TVL (degree)	93.4000	3.53986	96.9400	3.97009	<.0001**
Mx1 to Mx occlusal plane(degree)	61.6800	6.76482	57.9500	4.43462	.002**
Md1 to Md occlusal plane(degree)	68.0400	4.63333	65.2000	8.96706	.049*
Overjet(mm)	3.5200	1.21622	3.9200	.96553	.072
Overbite (mm)	3.8200	1.61549	3.8000	1.22057	.944
SOFT TISSUE THICKNESS					

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**
FACIAL LENGTHS AND HEIGHTS					
Nasion'-Menton' (mm)	132.360	3.9461	127.810	6.9311	<.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**
Lower 1/3 of face (mm)	75.050	4.0219	71.246	5.0739	<.0001**
Mx1 exposure (mm)	3.6020	1.86520	4.3200	1.26071	.027*
Maxillary height (mm)	24.000	3.1069	25.230	2.7371	.038*
Mandibular height (mm)	54.89	2.939	47.98	7.825	<.0001**
Nasolabial angle(degree)	98.72	14.682	104.14	14.682	. 047*
Upper lip angle(degree)	11.12	9.755	8.08	6.233	.066
PROJECTION TO TRUE VERTICAL LINE					
Glabella' (mm)	-13.250	3.8614	-12.340	4.5764	.285
Orbital rim (mm)	-30.430	3.0422	-24.240	10.1676	<.0001**
Cheek bone (mm)	-45.320	5.8465	-40.650	6.0897	<.0001**
Subpupil (mm)	-24.252	2.5777	-18.420	6.2043	<.0001**
Alar base (mm)	-15.880	1.9445	- 13.422	2.0021	<.0001**
Nasal projection(mm)	15.172	2.1385	13.430	2.6400	<.0001**
Subnasale' (mm)	.000	.000	.000	.000	.000
A point' (mm)	-2.370	.8795	-2.370	.9248	1.000
Upper lip anterior(mm)	2.080	2.3460	1.100	2.2610	.036*
Mx1 (mm)	-14.472	5.7222	-12.680	2.6912	.048*
Md1 (mm)	-18.760	3.5445	-15.680	2.5550	<.0001**
Lower lip anterior(mm)	-2.112	3.1404	-.756	2.5232	. 019*
B point' (mm)	-10.700	4.1857	-9.162	3.9977	.063
Pogonion' (mm)	-6.900	7.5139	-6.310	5.4350	.654
Neck throat length(mm)	54.120	6.6291	53.740	6.0274	.765
FACIAL HARMONY					
Mandibular Incisor – Pog'(mm)	15.020	9.6769	8.310	4.1242	<.0001**
Lower Lip Anterior – Pog'(mm)	5.800	3.5786	5.928	3.1662	.850
B Point' – Pog'(mm)	5.110	3.7106	2.788	2.0767	<.0001**
Subnasale'- Pog'(mm)	6.600	4.8192	6.670	4.8145	.942
A Point' – B Point'(mm)	7.460	3.5855	6.568	3.2923	.198
ULA – LLA(mm)	3.140	1.4107	2.384	1.3663	.008**
Orbital Rim – A Point'(mm)	28.920	3.5719	24.840	3.0597	<.0001**
Orbital Rim – Pog'(mm)	25.520	6.4373	20.134	5.7763	<.0001**
Facial Angle(degree)	163.19	7.127	161.79	6.877	.320
Glabella' – A Point'(mm)	11.360	3.6895	10.370	4.5857	.237
Glabella' – Pog'(mm)	8.870	6.1194	7.760	5.3750	.338

P <0.05 and P <0.01, significant; P >0.001, highly significant; P >0.05, not significant.

P <0.05 and P <0.01, significant; P >0.001, highly significant; P >0.05, not significant.

TABLE II: Comparison between Himachali Males and Arnett Males					
	HIMACHALI MALES		ARNETT'S MALES		P VALUE
	Mean (M)	SD	Mean (M)	SD	
DENTOSKELETAL FACTORS					
MxOP- TVL(degree)	93.4000	3.53986	95.0000	1.4000	.030*
Mx1_MxOP(degree)	61.6800	6.76482	57.8	3.0	<.0001**
Md1_MdOP(degree)	68.0400	4.63333	64.00	4.00	<.0001**
Overjet(mm)	3.5200	1.21622	3.0000	0.6000	.069
Overbite(mm)	3.8200	1.61549	3.2000	0.7000	.009**
SOFT TISSUE THICKNESS					
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**
FACIAL LENGTHS AND HEIGHTS					
Nasion'-Menton'(mm)	132.360	3.9461	137.7000	6.5000	<.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
Lower 1/3rd face(mm)	75.050	4.021	81.1000	4.7000	<.0001**
Mx1 exposure(mm)	3.6020	1.86520	3.9000	1.2000	.463
Maxillary height (mm)	24.000	3.1069	28.4000	3.2000	<.0001**
Mandibular height(mm)	54.89	2.939	56.0000	3.0000	.010**
PROJECTION TO TRUE VERTICAL LINE					
Glabella'(mm)	-13.250	3.8614	-8.0000	2.5000	<.0001**
Orbital rim'(mm)	-30.430	3.0422	-22.4000	2.7000	<.0001**
Subpupil'(mm)	-24.252	2.5777	-18.4000	1.9000	<.0001**
Cheek bone(mm)	-45.320	5.8465	-25.2000	4.0000	<.0001**
Alar base(mm)	-15.880	1.9445	-15.0000	1.7000	.002**
Nasal projection(mm)	15.172	2.1385	17.4000	1.7000	<.0001**
Subnasale'(mm)	.000	.000	.000	.000	<.0001*

					*
A point'(mm)	-2.370	.8795	-0.3000	1.0000	<.0001**
ULA(mm)	2.080	2.3460	3.3000	1.7000	.001**
Mx1(mm)	-14.472	5.7222	-12.0000	1.8000	.005**
Md1(mm)	-18.760	3.5445	-15.4000	1.9000	<.0001**
LLA(mm)	-2.112	3.140	1.0000	2.2000	<.0001**
B point'(mm)	-10.700	4.1857	-7.1000	1.6000	<.0001**
Pogonion'(mm)	-6.900	7.5139	-3.5000	1.8000	.002**
Neck throat length(mm)	54.120	6.6291	61.4000	7.4000	<.0001**
Nasolabial angle(degree)	98.72	14.682	106.4000	7.7000	.003**
Upper lip angle(degree)	11.12	9.755	8.3000	5.4000	.046*
FACIAL HARMONY					
Md1-Pog'(mm)	15.020	9.6769	11.9000	2.8000	.027*
LLA-Pog'(mm)	5.800	3.5786	4.4000	2.5000	.008**
B point'- Pog'(mm)	5.110	3.7106	3.6000	1.3000	.006**
Sn'- Pog'(mm)	6.600	4.8192	4.0000	1.7000	.770
A point'-B point'(mm)	7.460	3.5855	6.8000	1.5000	.199
ULA-LLA(mm)	3.140	1.4107	2.3000	1.2000	<.0001**
Or'- A point'(mm)	28.920	3.5719	22.1000	3.0000	<.0001**
Or'- Pog'(mm)	25.520	6.4373	18.9000	2.8000	<<.0001**
Gb'_Sn'_Pog'(degree)	163.19	7.127	169.4000	3.2000	<.0001**
Gb'-A point'(mm)	11.360	3.6895	7.8000	2.8000	<.0001**
Gb'-Pog'(mm)	8.870	6.119	4.6000	2.2000	.004**

TABLE III: Comparison between Himachali Females and Arnett Females

	HIMACHALI FEMALES		**ARNETT'S FEMALES**		**P VALUE**
	Mean (M)	**SD**	**Mean(M)**	**SD**	
DENTOSKELETAL FACTORS					
MxOP- TVL (degree)	96.9400	3.97009	95.6000	1.8000	<.0001**
Mx1_MxOP(degree)	57.9500	4.43462	56.8000	2.5000	.073
Md1_MdOP(degree)	65.2000	8.96706	64.3000	3.2000	.481
Overjet(mm)	3.9200	.96553	3.2000	0.4000	<.0001**
Overbite(mm)	3.8000	1.22057	3.2000	0.7000	.001**

SOFT TISSUE THICKNESS					
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
FACIAL LENGTHS AND HEIGHTS					
Nasion'-Menton'(mm)	127.810	6.9311	124.6000	4.7000	.038*
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**
Lower 1/3rd face(mm)	71.246	5.073	71.1000	3.5000	<.0001**
Mx1 exposure(mm)	4.3200	1.26071	4.7000	1.6000	.038*
Maxillary height (mm)	25.230	2.737	25.7000	2.1000	.340
Mandibular height(mm)	47.98	7.825	48.6000	2.4000	.581
PROJECTION TO TRUE VERTICAL LINE					
Glabella'(mm)	-12.340	4.5764	-8.5000	2.4000	<.0001**
Orbital rim'(mm)	-24.240	10.1676	-18.7000	2.0000	<.0001**
Subpupil'(mm)	-18.420	6.2043	-14.8000	2.1000	<.0001**
Cheek bone(mm)	-40.650	6.0897	-20.6000	2.4000	<.0001**
Alar base(mm)	- 13.422	2.0021	-12.9000	1.1000	.274
Nasal projection(mm)	13.430	2.6400	16.0000	1.4000	<.0001**
Subnasale'(mm)	.000	.000	.000	.000	<.0001**
A point'(mm)	-2.370	.9248	-0.1000	1.0000	<.0001**
ULA(mm)	1.100	2.2610	3.7000	1.2000	<.0001**
Mx1(mm)	-12.680	2.6912	-9.2000	2.2000	<.0001**
Md1(mm)	-15.680	2.5550	-12.4000	2.2000	<.0001**
LLA(mm)	-.756	2.5232	1.9000	1.4000	<.0001**
B point'(mm)	-9.162	3.9977	-5.3000	1.5000	.019*
Pogonion'(mm)	-6.310	5.4350	-2.6000	1.9000	<.0001**
Neck throat length(mm)	53.740	6.0274	58.2000	5.9000	<.0001**
Nasolabial angle(degree)	104.14	14.682	103.5000	6.8000	.706
Upper lip angle(degree)	8.08	6.233	12.1000	5.1000	<.0001**
FACIAL HARMONY					
Md1-Pog'(mm)	8.310	4.1242	9.8000	2.6000	.014*
LLA-Pog'(mm)	5.928	3.1662	4.5000	2.1000	.002**
B point'- Pog'(mm)	2.788	2.0767	2.7000	1.1000	.766
Sn'- Pog'(mm)	6.670	4.8145	3.2000	1.9000	<.0001**
A point'-B point'(mm)	6.568	3.2923	5.2000	1.6000	.005**
ULA-LLA(mm)	2.384	1.3663	1.8000	1.0000	.004**
Or'- A point'(mm)	24.840	3.0597	18.5000	2.3000	<.0001**
Or'- Pog(mm)'	20.134	5.7763	16.0000	2.6000	.0009**
Gb'_Sn'_Pog'(degree)	161.79	6.877	169.3000	3.4000	<.0001**
Gb'-A point'(mm)	10.370	4.5857	8.4000	2.7000	.004**
Gb'-Pog'(mm)	7.760	5.3750	5.9000	2.3000	.018*

P <0.05 and P <0.01, significant; P >0.001, highly significant; P >0.05, not significant.

TABLE IV: Comparison Between Himachali Males And South Indian Males

	HIMACHALI MALES		SOUTH INDIAN MALES		P VALUE
	Mean (M)	SD	Mean(M)	SD	
DENTOSKELETAL FACTORS					
MxOP- TVL (degree)	93.4000	3.53986	91.5000	7.9300	0.144
Mx1_MxOP(degree)	61.6800	6.76482	54.4700	5.7000	<.0001**
Md1_MdOP(degree)	68.0400	4.63333	64.2700	15.6000	<.0001**
Overjet(mm)	3.5200	1.21622	2.9000	0.8800	.001
Overbite(mm)	3.8200	1.61549	3.1800	0.9600	.007
SOFT TISSUE THICKNESS					
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
FACIAL LENGTHS AND HEIGHTS					
Nasion'-Menton'(mm)	132.360	3.9461	132.7300	8.8000	.510
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**
Lower 1/3rd face(mm)	75.050	4.0219	72.40	7.41	<.0001**
Mx1 exposure(mm)	3.6020	1.86520	0.15	0.48	<.0001**
Maxillary height (mm)	24.000	3.1069	24.8200	3.3200	.068
Mandibular height(mm)	54.89	2.939	50.7300	4.4900	<.0001**
PROJECTION TO TRUE VERTICAL LINE					
Glabella'(mm)	-13.250	3.8614	-11.00	5.7100	<.0001**
Orbital rim'(mm)	-30.430	3.0422	-29.07	4.2400	.003
Subpupil'(mm)	-24.252	2.5777	-23.98	3.97	.459
Cheek bone(mm)	-45.320	5.8465	-37.270	6.2800	<.0001**
Alar base(mm)	-15.880	1.9445	-23.980	3.9700	<.0001**
Nasal projection(mm)	15.172	2.1385	15.32	1.79	.751
Subnasale'(mm)	.000	.000	.000	<.0001	<.0001**
A point'(mm)	-2.370	.8795	-1.28	1.50	<.0001**
ULA(mm)	2.080	2.3460	3.5300	1.7400	.004
Mx1(mm)	-14.472	5.7222	-11.82	3.32	.002
Md1(mm)	-18.760	3.5445	-15.170	3.1700	<.0001**
LLA(mm)	-2.112	3.1404	1.52	2.08	.00015
B point'(mm)	-10.700	4.1857	-8.0500	3.1800	<.0001**
Pogonion'(mm)	-6.900	7.5139	-5.4800	3.3400	.188
Neck throat length(mm)	54.120	6.6291	55.23	10.11	.555
Nasolabial angle(degree)	98.72	14.682	97.27	9.42	.458
Upper lip angle(degree)	11.12	9.755	13.97	6.89	.165
FACIAL HARMONY					

Md1-Pog'(mm)	15.020	9.6769	8.6500	3.9900	0.001**
LLA-Pog'(mm)	5.800	3.5786	6.1300	3.1300	0.677
B point'- Pog'(mm)	5.110	3.7106	3.1700	1.6400	0.008
Sn'- Pog'(mm)	6.600	4.8192	4.9300	3.0900	0.094
A point'-B point'(mm)	7.460	3.5855	6.4300	2.9900	0.190
ULA-LLA(mm)	3.140	1.4107	2.8200	1.8000	0.379
Or'- A point'(mm)	28.920	3.5719	27.1300	5.2000	0.072
Or'- Pog'(mm)	25.520	6.4373	23.4300	5.5100	0.143
Gb'_Sn'_Pog'(degree)	163.19	7.127	166.77	8.30	0.044
Gb'-A point'(mm)	11.360	3.6895	10.1700	5.4100	0.246
Gb'-Pog'(mm)	8.870	6.1194	6.5800	5.3000	0.142

P <0.05 and P <0.01, significant; P >0.001, highly significant; P >0.05, not significant

TABLE V: Comparison between Himachali Females and South Indian Females

	HIMACHALI FEMALES		**SOUTH INDIAN FEMALES**		**P VALUE**
	Mean (M)	**SD**	**Mean(M)**	**SD**	
DENTOSKELETAL FACTORS					
MxOP- TVL (degree)	96.9400	3.97009	85.6000	8.6400	<.0001**
Mx1_MxOP(degree)	57.9500	4.43462	55.8700	6.6600	.002**
Md1_MdOP(degree)	65.2000	8.96706	64.6000	13.0700	.638
Overjet(mm)	3.9200	.96553	2.6000	0.7600	<.0001**
Overbite(mm)	3.8000	1.22057	3.1200	0.8700	<.0001**
SOFT TISSUE THICKNESS					
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)			11.0300	1.7800	<.0001**
Menton-Menton'(mm)			7.2800	2.3800	.273
FACIAL HEIGHTS AND LENGTHS					
Nasion'-Menton'(mm)	127.810	6.9311	122.0300	7.0300	<.0001**
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**
Lower 1/3rd face(mm)	71.246	5.0739	63.13	9.07	.107
Mx1 exposure(mm)	4.3200	1.26071	0.87	1.48	<.0001**
Maxillary height (mm)	25.230	2.7371	24.9300	5.2400	.303
Mandibular height(mm)	47.98	7.825	44.5000	5.6900	.003**
PROJECTION TO TRUE VERTIAL LINE					
Glabella'(mm)	-12.340	4.5764	-9.0200	4.4700	<.0001**
Orbital rim'(mm)	-24.240	10.1676	-27.800	6.1300	.017*
Subpupil'(mm)	-18.420	6.2043	-23.13	4.28	<.0001**
Cheek bone(mm)	-40.650	6.0897	-33.470	6.2200	<.0001**
Alar base(mm)	- 13.422	2.0021	-23.130	4.8200	.063

Nasal projection(mm)	13.430	2.6400	14.40	2.40	.012*
Subnasale'(mm)	.000	.000	.000	.000	<.0001**
A point'(mm)	-2.370	.9248	-1.38	1.50	<.0001**
ULA(mm)	1.100	2.2610	2.3300	1.8800	<.0001**
Mx1(mm)	-12.680	2.6912	-9.80	2.81	<.0001**
Md1(mm)	-15.680	2.5550	-13.070	2.9600	<.0001**
LLA(mm)	-.756	2.5232	0.05	2.53	.028*
B point'(mm)	-9.162	3.9977	-8.2700	2.9600	.205
Pogonion'(mm)	-6.310	5.4350	-6.9000	3.4000	.446
Neck throat length(mm)	53.740	6.0274	56.43	7.10	.003**
Nasolabial angle(degree)	104.14	14.682	103.47	13.08	.719
Upper lip angle(degree)	8.08	6.233	11.23	5.21	.023*
FACIAL HARMONY					
Md1-Pog'(mm)	8.310	4.1242	6.2000	2.3000	.001**
LLA-Pog'(mm)	5.928	3.1662	6.6500	2.1700	.113
B point'- Pog'(mm)	2.788	2.0767	2.0700	1.0400	.018*
Sn'- Pog'(mm)	6.670	4.8145	6.1300	2.9200	.432
A point'-B point'(mm)	6.568	3.2923	6.9200	2.8700	.453
ULA-LLA(mm)	2.384	1.3663	2.5300	1.8800	.453
Or'- A point(mm)'	24.840	3.0597	26.1700	6.7200	.003**
Or'- Pog'(mm)	20.134	5.7763	21.3000	6.9700	.4214
Gb'_Sn'_Pog'(degree)	161.79	6.877	161.30	14.26	.617
Gb'-A point'(mm)	10.370	4.5857	7.9700	4.7300	.028*
Gb'-Pog'(mm)	7.760	5.3750	4.4300	3.7900	<.0001**

P <0.05 and P <0.01, significant; P >0.001, highly significant; P >0.05, not significant.

TABLE VII: Comparison between Himachali Females and Andhra Females

	HIMACHALI FEMALES		ANDHRA FEMALES		P VALUE
	Mean (M)	SD	Mean(M)	SD	
DENTOSKELETAL FACTORS					
MxOP- TVL (degree)	96.9400	3.97009	99.3333	6.2109	<.0001**
Mx1_MxOP(degree)	57.9500	4.43462	46.7333	18.2018	<.0001**
Md1_MdOP(degree)	65.2000	8.96706	63.4333	5.4563	.170
Overjet(mm)	3.9200	.96553	3.7000	0.6513	.114
Overbite(mm)	3.8000	1.22057	3.6833	1.2140	.501
SOFT TISSUE THICKNESS					
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
FACIAL LENGTHS AND HEIGHTS					
Nasion'-Menton'(mm)	127.810	6.9311	123.2333	5.0082	<.0001**
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**
Lower 1/3rd face(mm)	71.246	5.0739	65.9333	4.4716	<.0001**
Mx1 exposure(mm)	4.3200	1.26071	3.2000	1.1111	<.0001**

Maxillary height(mm)	25.230	2.7371	23.6667	2.6566	.248
Mandibular height(mm)	47.98	7.825	46.4500	2.6631	.337
PROJECTION TO TRUE VERTIAL LINE					
Glabella'(mm)	-12.340	4.5764	-9.0000	5.1394	.005**
Orbital rim'(mm)	-24.240	10.1676	-19.7500	3.5227	.033*
Subpupil'(mm)	-18.420	6.2043	-17.7667	3.8095	.490
Cheek bone(mm)	-40.650	6.0897	-22.5000	3.8101	<.0001**
Alar base(mm)	- 13.422	2.0021	-15.3667	3.2746	.758
Nasal projection(mm)	13.430	2.6400	14.3167	2.1754	.146
Subnasale'(mm)	.000	.000	00000	00000	00000
A point'(mm)	-2.370	.9248	-0.9500	0.5469	<.0001**
ULA(mm)	1.100	2.2610	3.3333	1.3412	<.0001**
Mx1(mm)	-12.680	2.6912	-9.2000	2.5346	<.0001**
Md1(mm)	-15.680	2.5550	-13.6000	2.4332	.001**
LLA(mm)	-.756	2.5232	2.9333	1.3755	<.0001**
B point'(mm)	-9.162	3.9977	-6.9833	22.7085	.3405
Pogonion'(mm)	-6.310	5.4350	-6.0833	3.2246	.846
Neck throat length(mm)	53.740	6.0274	62.9833	7.9638	<.0001**
Nasolabial angle(degree)	104.14	14.682	104.6000	9.1712	.528
Upper lip angle(degree)	8.08	6.233	11.4667	2.8975	.011**
FACIAL HARMONY					
Md1-Pog'(mm)	8.310	4.1242	8.2167	4.0187	.925
LLA-Pog'(mm)	5.928	3.1662	7.0333	2.5084	.127
B point'- Pog'(mm)	2.788	2.0767	-2.3000	1.0875	<.0001**
Sn'- Pog'(mm)	6.670	4.8145	-6.1167	3.0925	<.0001**
A point'-B point'(mm)	6.568	3.2923	5.5167	1.8546	.136
ULA-LLA(mm)	2.384	1.3663	3.1333	1.1059	.018*
Or'- A point'(mm)	24.840	3.0597	18.8833	3.3417	<.0001**
Or'- Pog'(mm)	20.134	5.7763	13.3500	5.5958	<.0001**
Gb'_Sn'_Pog'(degree)	161.79	6.877	167.6667	4.6263	<.0001**
Gb'-A point'(mm)	10.370	4.5857	7.8333	4.6965	.0285*
Gb'-Pog'(mm)	7.760	5.3750	6.8667	3.6245	.449

P <0.05 and P <0.01, significant; P >0.001, highly significant; P >0.05, not significant.

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