

Cephalometric Norms for Hyderabad Population in Natural Head Position using extracranial reference lines

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ABSTRACT:

INTRODUCTION: Natural head position is a standardized and reproducible position of the head in an upright position. The cephalometric values obtained in this position said to be more nearer to living being. Hence norms are framed in this position for clinical use.

AIMS & OBJECTIVES: To establish cephalometric norms for Hyderabad population in NHP using extra cranial reference lines. To compare with cephalometric norms derived for Caucasian population in NHP using extra cranial reference lines. To compare the male and female norms obtained for local Hyderabad population.

MATERIALS AND METHODS: Photographs are taken with patient looking straight in to the mirror standing in front of the mirror and at closest possible distance to nylon thread suspended with plumbum. 6x4 prints are obtained. Difference between E-line and true vertical (nylon thread) is noted. Lateral cephalograms are taken and E-line was drawn and the true vertical was drawn as recorded from lateral photograph. Angular and linear values obtained with NHP.

DISCUSSION AND SUMMARY: The study shows that the anteroposterior position of maxilla and mandible closely resembles values presented by Proffite and White. The value obtained for the AB-TH angle in this study suggestive of skeletal class III. The facial height ratio was found to be within the ratio. Males displayed large facial height over females. The inclination of palatal plane ($90,45 \pm 1.9$) found to be similar to Caucasian. The mandibular plane angle was found to be much lower in comparison to Caucasian. Males displayed much less angle over females.

Key words: E-line Race

INTRODUCTION:

Natural head position is a standardized and reproducible position of the head in an upright position, the eyes focused on a pointing the distance at eyelevel that implies the visual axis is horizontal (FA Moorrees).¹

Natural head position is the reproducible, natural, physiologic position of the head obtained with relaxed subject looks ahead at an external eye reference-like wall mirror (Cooke & Wei).²

Traditional cephalometric analysis use the S-N or FH planes as reference lines. As the position of Sella can vary both antero posteriorly and vertically, it was cited the claim of Downs and Rickets that Sella is totally unrelated to the structure of face. Downs and Rickets recommended the use of FH plane as reference plane. But measurements based on FH plane do not correlate with clinical examination.

The high interpersonal variability of intracranial reference planes (SN and FH) to each other within the individual provide different interpretations with different analysis.^{2,3,4,5} Hence Cooke & Wei and Michiels suggested use of natural head position.

The natural head position analysis present the patient as they appear in life. As stated by Chanan et al, awareness of deviation of facial structure could modify craniocervical posture ex. too protrusive chin and retrusive chin.

Techniques to obtain NHP for better analysis are demanding, expensive and time consuming.^{6,7} Pedro and Nanda⁸ and N.M.Bass⁹ made the profile angle the basis for recording and transferring NHP to radiograph.

AIMS AND OBJECTIVES:

To establish cephalometric norms for Hyderabad population in NHP using extra cranial reference lines. To compare with cephalometric norms derived for Caucasian population in NHP using extra cranial reference lines. To compare the male and female norms obtained for local Hyderabad population.

METHODS OF RECORDING:

NATURAL HEAD POSITION Target on mirror method,⁵ the fluid level device,⁶ the photographic technique,¹⁰ modified approach,¹¹ Bass method, Pedro Leitao Ram S Nanda method, incline meter metho etc.

MATERIALS AND METHODS:

This is a descriptive and comparative study carried in Hyderabad, A.P. The sample include 30 adults (15 males and 15 females) table 1. Criteria include, local residents, age 18 to 30 years presenting clinically normal occlusion, esthetically acceptable profiles, facial symmetry, no previous orthodontic treatment, no history of trauma or any related surgery. A simple technique suggested by Pedro and Nanda used making use of a true vertical represented by a free hanging plumb attached to nylon thread and photograph used to record profile angle.

Recording NHP and True Vertical on the photograph: Standard photographs taken with natural head position, centric relation and relaxed lip posture. All photographs taken Nikon EM camera with Nikkor 105 lens.

To get NHP the subject is asked to stand in front of a mirror which is placed 2 meters in front of the subject. Subject keep the feet slightly a part and divergent anteriorly with arms relaxed and is looking straight in to the mirror in its eyes with its tilting head up and down with decreasing amplitude unless they felt they were relaxed (fig 2).

A nylon thread with a plumb suspended from a L shaped clamp fixed at a height of 9ft, in front of the subject served as a true vertical (fig1). The subject was made to stand as close as possible to the thread. The camera was fixed with a tripod at a distance of 1.7 meters on the lateral aspect of subject and photograph taken (fig 3). 6x4 print was taken and E-plane (pogonion to prenasale) was drawn. The difference between true vertical (nylon thread) and E-line was noted.

STANDARIZATION OF CEPHALOMETRIC TECHNIQUE AND ARMENTARIUM: a 8X10 Kodak green sensitive head film with intensifying screen with "ROTOGRAPH 230 EUR" by VILLA SYSTEM MEDICALI INDIA, advanced panaromic and cephalometric equipment manufactured in 1995 made in MILANO Italy was used. All instructions as per manufacturer were strictly followed.

TRACING TECHNIQUE: All tracings were done by single operator. Garware 36 microns acetate paper was used. Tracings are made as per standards (fig 4).

TRANSFER OF PROFILE ANGLE TO TRACING: A photocopy 1:1 of the cephalometric tracing was made and then E-plane was drawn on it. With the

help of the angle noted from the photograph (fig3), true vertical was drawn at the same angle to the E-plane on the tracing. A line drawn perpendicular to the true vertical serves as true horizontal (fig 5).

A total of 25 parameters - 12 skeletal (nine angular and six linear); 4 dental (two linear and two angular) and 5 soft tissue were evaluated.

Skeletal Evaluation (Angular measurements):

1. Antero posterior position of maxilla (Maxillary angle)
2. Antero posterior position of chin (Chin angle)
3. AB-T.H
4. Vertical position of maxilla (palatal plane angle)
5. Vertical position of mandible (mandibular plane angle)
6. NSL-T.H
7. SNA
8. SNB
9. ANB

SKELETAL (Linear measurements)

10. Nasion perpendiculars to point A
11. Nasion perpendiculars to point Pogonion
12. Nasion perpendicular to point B
13. AB projected on to true horizontal
14. N-ANS
15. ANS-Me
16. N-ANS/ANS-Me ratio

DENTAL (Linear):

17. Upper incisor to through vertical through subnasale
18. Lower incisor to True vertical through point A

DENTAL EVALUATION (ANGULAR)

19. Upper incisor to true horizontal
20. Lower incisor to true horizontal

SOFTTISSUE EVALUATION

21. Upper lip prominence
22. Lower lip prominence
23. Chin position
24. Nasal projection
25. Viazzi's V-angle

STATISTICAL ANALYSIS: Mean is the sum of observation divided by number of Observation

$$\bar{x} = \frac{\sum X}{N}. \text{ (tables 4\&5).}$$

T-Test was used to calculate the difference between the Caucasian and local population means(table-3). The statistical software by name MATLAB was used. To generate tables, Microsoft word and excel were used for tabulations.

ANOVA TEST(table -6) : If calculated value of "F"

$$F = \frac{\text{Estimate of variance based on the variation between the groups}}{\text{Estimate of variance based on the variation within the groups}}$$

Is more than table value of F at required level of significance, usually .05 Or .01 then we reject the null hypothesis.

RESULTS:

SKELETAL EVALUATION (Angular measurements) (table -6)

1. Anteroposterior position of Maxilla (Maxillary angle):² It is not effected by position of Sella. Rickets estimate was $90 \pm 3^\circ$ In this study the over all mean was $91.45 \pm 2.93^\circ$ with mean for males $90.6 \pm 2.16^\circ$ and for female $92.30 \pm 3.4^\circ$. Statistically significant difference was found in the position of maxilla. One way analysis of variance shown that no difference exist between the Hyderabad males and females (table 4&5).
2. Anteropostero position of chin (Chin angle)¹² Angle between N-Pog and TH. Similar to Down's Facial angle, used to measure chin prominence. The conventional angle describes the dentoskeletal architecture; where as the angle in the study denotes the architecture what appears to others. For Caucasians the over all mean was 87.7 ± 2.5 . The value in the present study was 89.38 ± 2.47 (table -3). No significant difference was found between male and female in Hyderabad population with values of 89.60 ± 3 and 89.17 ± 1.8 (table-6).
3. AB-T.H:¹³ The methods so far available may not be so accurate because of difficulties in reproducing some plane. For example the difficulty to reproduce the functional occlusal plane in Wits appraisal. The present AB/horizontal measure is simple and practical. It eliminates Nasion and intracranial planes. In the present method the overall value is 6.80 ± 3.1 . No significance difference was between males and females with values of 5.83 ± 1.78 and 7.77 ± 3.91 respectively.
4. VERTICAL POSITION OF MAXILLA (Palatal plane angle):⁸ Possible rotation of maxilla or

anterior or posterior inclination of maxilla is revealed by this angle. The mean value obtained by Nanda in his study was $89.52 \pm 4.38^\circ$. The mean value in the present study was $90.45 \pm 1.33^\circ$. For male it was 90.47 ± 2.5 and for female $90.43 \pm 1.33^\circ$ (table -6).

5. **VERTICAL POSITION OF MANDIBLE (Mandibular plane angle):**¹² A high angle indicates open bite tendency and low angle indicates deep bite. A. Viazi found this angle to be 24 ± 4 . In the present study the overall mean was 18.87 ± 4.47 , indicating significantly high difference. For males this is 17.33 ± 4.6 and for females 20.33 ± 3.9 (table -6).
6. **NSL-T.H:**^{8 14} Used to determine the inclination of anterior cranial base. The over all mean in the present study is 8.65 ± 1.83 which was significantly different from considered to be normal value of 7 degrees. In male it is 8.83 ± 1.4 and in female 8.47 ± 2.16 (table -6).

SKELETAL (Linear measurements)

7. **Nasion perpendicular to point A (N \perp A):**^{15 8 14} According to Proffit and White, for most Caucasians point A is ahead by 2mm to nasion perpendicular line. In this study the overall mean is 1.8 ± 3.39 mm. No statistical significant difference found between Hyderabad population and above study. But males and females shown marked difference with values of 1.2 ± 3.3 and 2.46 ± 3.6 mm in present study.
8. **Nasion perpendicular to Pogonion:**^{15 8 14} It reveals the relation of mandible to cranial base. According to Mc Namara, it is -2 to ± 4 . Proffit and White proposed it to be 2mm. In the present study it is $-.52 \pm 3.99$. No significant difference between males and females with values $.7 \pm 4.5$; $.97 \pm 3.4$.
9. **Nasion perpendicular to point B:**^{15 8 14} Proffit and White found it to be -2mm. In the present study it is -3 ± 3.7 mm. No significant difference found within the groups or in between males and females in the present study with values males -3.27 ± 4.1 and females -2.73 ± 3.6 mm.
10. **AB projected on to true Horizontal:** According to Proffit and White¹⁴ and Viazi's¹⁶ mean value of 4mm with SD of 2mm with true horizontal plane consideration. In the present study the mean value was found to be 4.8 ± 2.1 mm. Compared with Caucasian value the difference was found to be significant. Mean value in males was 4.46 ± 1.9 and females 5.167 ± 2.3 mm.

11. **N-ANS/ANS-Me Ratio:** According to Pedro Lei Tao & Ram S.Nanda⁸ facial axis, lower face height and facial ratio are morphological variables often associated with NHP. In the present study the ratio was $.79 \pm .06$ which within the range suggested by burstone.¹⁷ Significant difference was found between males and females.

DENTAL EVALUATION (Linear) (table -6)

12. **Upper Incisor to True vertical through Subnasale (SN Ver-T.H):** The Arnett⁴ analysis ratio this distance was -12mm for males and -9mm for females. In this study it was -10.83mm for males and -8.37mm for females. Significant difference was found between males and females.
13. **Lower incisor to True vertical through point A (Aver-L-1):** According to N.MBass⁹ the anterior contour of lower incisor will touch this line. In the present study the mean value was found to be 2.68 ± 2.1 mm.

DENTAL EVALUATION

14. **Upper incisor to True horizontal(U,I to T,H):**¹³ This angle shows the inclination of upper incisor as it appears in life. Mean value was 12.38 ± 5.6
15. **Lower Incisor to True Horizontal(L.I to T.H):**¹³ This angle reveals the true proclination of lower incisor in life. The mean value was 122 ± 4.5

SOFT TISSUE EVALUATION:

16. **Upper Lip Prominence (SNver- U.I.):** Bell et al Arnet¹⁸ and Bass⁹ measured the Upper lip position in relation to true vertical through subnasale. According to Bell et al it should be 1 or 2 mm ahead of this line. In the present study it was 3.08 mm suggesting more prominent upper lip in local population.
17. **Lower Lip Prominence (SNver - L.I.):** Bell et al, Arnett and Bass found that the lower lip should be 0 to -1mm to SN vertical. In our study it was .45mm reflecting similar lip prominence.
18. **Chin Position:** Bell et al¹⁹ Bass⁹ and Arnett¹⁸ related the soft tissue chin to a true vertical through subnasale. According to Bell et al the range is -1 to -4mm but according to Arnett and Bergman it is -2.6 ± 1.9 ; -3.5 ± 1.8 mm for males and females. In the present study over all mean was -5.75mm with males -5.80 ± 3.29 and females -5.7 ± 2.84 mm.

19. Nasal Projection: Horizontal distance from nasal tip to SN vertical in the present study for males it was 16.50mm for females 15.68mm. For Caucasian males it is 17.4mm¹⁸ and females 16mm.¹⁸

20. Viazi's "V angle": It concentrates on the lower half of the face and concentrates on nose. According to Anthony D. Viazi²⁰ it is -12.5 ± 4 for Caucasian. In the present study it was found to be -13.19 ± 3.2 ; no statistically significant difference. However statistically significant difference was found between males and females in local population with values -12.96 ± 2.9 , -14.1 ± 3.2 respectively.

Discussion and Summary: The study shows that the anteroposterior position of maxilla and mandible closely resembles values presented by Proffite and White (table 2).

The value obtained for the AB-TH angle in this study closely matches values of Cooke & Vei suggestive of skeletal class III ($< 12^\circ$).

The facial height ratio was found to be within the ratio by Burstone. Males displayed large facial height over females (table-6).

The inclination of palatal plane ($90,45 \pm 1.9$) found to be similar to Caucasian (90.48 ± 4.3) as observed by Pedro, Nanda³⁹ (table-3).

The mandibular plane angle was found to be much lower in comparison to Caucasian (table-3). Males displayed much less angle over females (table-6); which is in accordance with previous studies on local population.

Inclination of SN line was found to be higher than normal 7 degrees. Males and females displayed marked similarity in inclination reinforcing Steiner's analysis (table-6).

Lip values are higher side compared to previous studies.⁹ Chin position was less prominent both in males and females compared with Bell et al, Arnett & Bregman¹⁸ (table-3). This is in contrast to chin angle of Viazi.

Nasal projection values are correlating with Caucasian values.

Upper incisor position matches with that of Caucasian.

'V' angle predicted same profile for both Caucasian and local population. Statistically significant

difference was found between male and female with values -12.16 ± 2.9 and -14.1 ± 3.2 respectively. Prominent maxilla observed in females might be the contributor for this difference.

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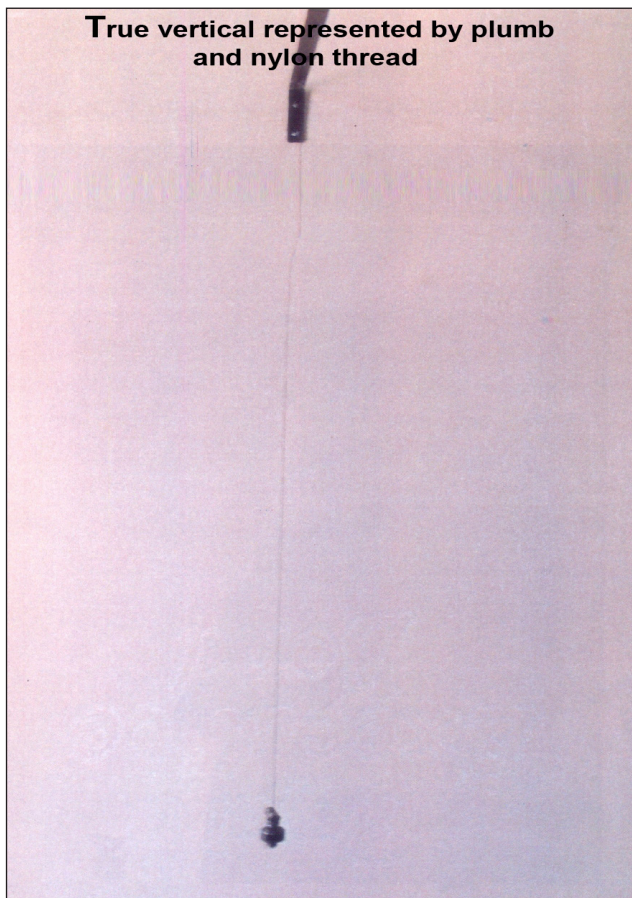


FIG 1: True vertical represented by plumb & nylon thread



FIG 2: Subject with NHP

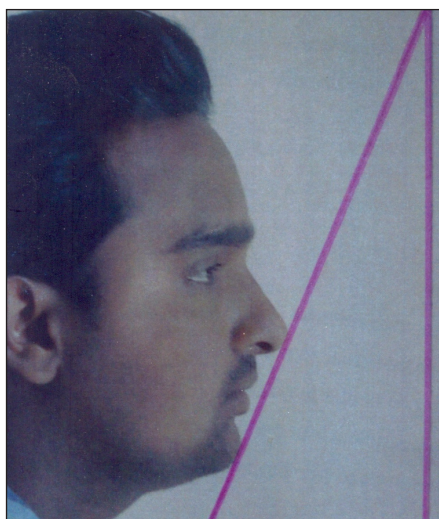


FIG 3: Subject in NHP. True vertical is represented by plumb line. NHP measured through Angle 'E' line vertical

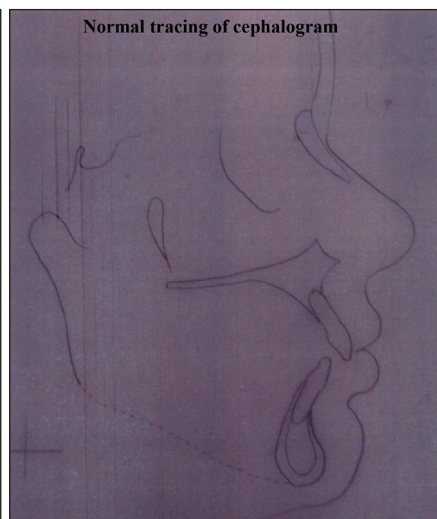


FIG 4: Normal tracing of cephalogram

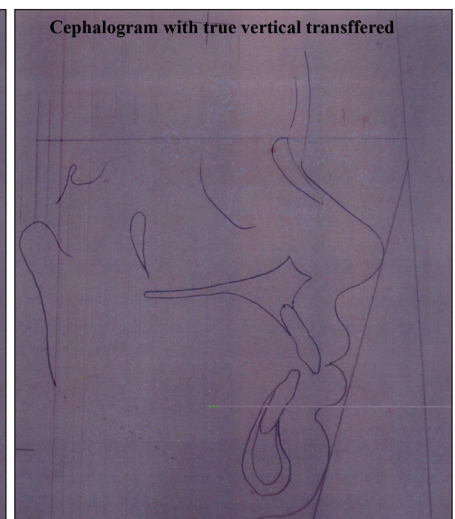


FIG 5: Cephalogram with true vertical transferred

TABLE 1
SEX DISTRIBUTION

Sex	Number	Percentage
MALES	15	50
Female	15	50
Total	30	100

TABLE 2
COMPOSITE NORMS

S.No.	Variables	Mean	S.D.	S.E	95% Confidence Interval For Mean		Min	Max
1.	AB PROJ TH	4.81	2.15	.39	4.01	5.62	-.5	9.0
2.	N \perp A	1.85	3.39	.62	.56	3.10	-6.0	9.0
3.	N \perp B	-3.0	3.74	.68	-4.40	-1.60	-14	8.5
4.	N \perp Pog	-.52	3.99	.73	-2.01	.98	-11	4
5.	N-ANS	55.45	3.61	.66	54.10	56.80	48.5	7
6.	ANS-ME	68.70	5.31	.96	66.71	70.68	60.0	64.0
7.	N-ANS/ANS/ME	.79	.06	.11	.77	.82	.67	82.0
8.	NA-TH	91.45°	2.93°	.53°	90.35°	92.55°	86°	94
9.	NPog-TH	89.38°	2.47°	.45°	88.46°	90.31°	85°	98°
10.	AB-TH	6.80°	3.14°	.57°	5.63°	7.97°	-1°	98°
11.	GO-GN-TH	18.83°	4.47°	.81°	17.16	20.50°	8.0°	14°
12.	NSL-TH	8.65°	1.83°	.33°	7.96°	9.34°	3°	27.0°
13.	PP-TV	90.45°	1.99°	.36°	89.71°	91.19°	83°	11°
14.	SNver-U.I	9.60	2.38	.43	8.71	10.49	5	93°
15.	Aver-LI	2.68	2.19	.400	1.86	3.50	-1.0	14
16.	U.I-TH	113.95°	5.52°	1.00°	111.89°	116.01°	103°	8.0
17.	L.I-TH	1220.6°	5.62°	1.02°	118.52°	122.72°	106°	127°
18.	SN-VER/UL	3.08	1.43	.26	2.55	3.62	1	132°
19.	SN-VER/L.L	.45	2.22	.40	-3.8	1.28	-5	7
20.	SN-VER/CHIN	-4.37	5.00	.91	-6.24	-2.50	-12	5
21.	NASAL PROJ	16.10	1.63	.304	15.48	16.73	13	8
22.	V ANGLE	13.29°	3.25°	.60°	12.02°	14.53°	8.0°	19.0°
23.	SNA	83.17°	3.96°	.72°	81.68°	84.65°	76°	91°
24.	SNB	79.53°	2.77°	.50°	78.50°	80.57°	74°	83°
25.	ANB	3.63°	2.04°	.37°	2.87°	4.40°	-1°	8°

TABLE -3
COMPARISON OF HYDERABAD AND CAUCASIAN POPULATION

T-test

S.No.	Variables	Sample Mean	Caucasian Mean	Standard Deviation	Min	Max	'P Value
1.	AB proj TH	4.817	4	2.15	1.5	8	<.05
2.	NI to a	1.833	2	3.39	-6	8,5	>.05
3.	NI to B	-3mm	-2	3.74	-8	2	>.05
4.	NI to Pog	-.52mm	0	3.99	-11	7	
5.	N-ANS	55.450mm	N A	3.6	48.5	64	
6.	ANS-ME	68.,7mm	N A	5.1	60	82	
7.	N-ANS/ANS-ME	.79mm	N A	.06	.67	.94	>.05
8.	NA-T H	91.45°	90°	2.93	86	98	<.05
9.	NPog- T H	89.38°	87.5°	2.5	85	98	<.05
10.	AB-T H	6.8°	N A	3.14	-1	14	
11.	GO-GN-T H	18.83°	24	4.47	8	27	<.05
12.	NSL-T H	8.65°	8.19	1.83	3	11	
13.	PP-RV	90.45°	89.52	1.99	83	93	
14.	SN-VER/UL	3.08mm	2	1.43	-1	7	
15.	SN-VER/LL	.45..	0-(-1)	2.22	-5	5	
16.	SN VERT/CHIN	-4.37mm	1-(-4)	5	-12	1	
17.	NASAL/Projection	16mm	16(F) & 17.4(M)	1.63	13	20	
18.	VIAZIS ANGLE	13.19°	12.5	3,2	8	19	>.05
19.	SN vert UI	-9.60mm	9(F) & 12(M)	2.38	-5	-14	
20.	A vert LI	2.68mm	0	2.19	-1	8	
21.	UI — T H	113.95°	N A	5.52	103	127	
22.	LI —T H	120.62°	N A	5.62	106	132	
23.	SNA	83.17°	82	3.96	76	91	
24.	SNB	79.53°	80	2.77	74	84	
25.	ANB	3.63°	2	2.04	-1	8	<.05

N A- not available

p_≤.05= significant

UL-upper lip, LL- lower lip

F- female AB-T H angle available only for 12 yrs olds

UI & LI upper & lower incisors

M - male

U.I-T H & L.I - T H value available for 12 yrs olds

TABLE 4
MALE NORMS

S.No.	Variables	Mean	S.D.	S.Error	95% Confidence Interval For Mean		Min	Max
1.	AB proj T H	4.46	1.93	.49	3.39	5.53	1.5	8.0
2.	N ⊥ A	1.20	3.14	.81	-.54	2.94	-6.0	8.5
3.	N ⊥ B	-3.27	4.18	1.08	-5.59	-.95	-14	4
4.	N ⊥ Pog	-.07	4.57	1.18	-2.60	2.47	-11	7
5.	N-ANS	57.43	2.84	.73	55.85	59.01	53.0	64.0
6.	ANS-ME	71.66	5.17	1.33	68.79	74.53	63.0	82.0
7.	N-ANS/ANS-ME	.79	.06	.01	.75	.83	.69	.94
8.	NA-T H	90.60	2.16	.559	89.0	91.80	86	94
9.	N-Pog-T H	89.60	3.06	.78°	87.91°	91.29°	85°	98°
10.	AB-T H	5.83°	1.78°	.45°	4.85°	6.82°	3°	9°
11.	GO-GN-TH	17.33°	4.61°	1.19°	14.77°	19.89°	8.0°	22.5°
12.	NSL-T H	8.83°	1.49°	.38°	8.00°	9.66°	7°	11°
13.	PP-TV	90.47°	2.53°	.65°	89.06°	91.87°	83°	93°
14.	SN vert-U I	10.83	2.51	.64	9.44	12.22	6	14
15.	A vert LI	3.00	2.07	.53	1.84	4.15	.0	6.0
16.	UI T H	113.7°	5.30°	1.36°	110.53°	116.40°	103°	123°
17.	LI T H	120.17°	4.65°	1.20°	117.59°	122.74°	111°	128°
18.	SN vert U L	3.17	1.39	.361	2.39	3.94	1	6
19.	SN vert LL	.20	2.61	.67	-1.25	1.65	-5	5
20.	SN vert CHIN	-5.80	3.29	.85	-7.63	-3.97	-11	1
21.	NASL/Projection	16.50	1.86	.48	15.47	17.53	13	20
22.	Viazis angle	12.16°	2.90°	.75°	10.55°	13.77°	8.0°	17.5°
23.	SNA	82.27°	3.12°	.80°	80.54°	84.00°	76°	88°
24.	SNB	79.33°	2.52°	.65°	77.93°	80.73°	74°	84°
25.	ANB	2.93°	1.45°	.37°	2.13°	3.74°	1°	7°

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TABLE 5
FEMALE NORMS

S.No.	Variables	Mean	S.D.	S.Error	95% Confidence Interval For Mean		Min	Max
1.	AB proj T H	5.16	2.36	.61	3.85	6.47	-5	9
2.	N4 \perp A	2.46	3.62	.93	.46	4.47	-2	8
3.	N4 \perp B	-2.73	3.36	.86	-4.60	-.87	-8	2
4.	N4 \perp Pog	-0.7	3.43	.88	-2.87	.93	-7	4
5.	N-ANS	53.46	3.24	.83	51.66	55.26	48.5	59
6.	ANS-ME	65.73	3.57	.92	63.75	67.71	60	72
7.	N-ANS/ANS ME	.8	.05	.01	.77	.83	.67	.9
8.	NA- T H	92.3°	3.4°	87°	90.41°	94.19°	88°	98°
9.	N-Pog —T H	98.17°	1.80°	.46°	88.16°	90.17°	86°	91°
10.	AB- T H	7.77°	3.91°	1.01°	5.6°	9.93°	-1°	14°
11.	GO-GN-T H	20.33°	3.91°	1.01°	18.16°	22.5°	14.5°	27°
12.	NSL-T H	8.47°	2.16°	.55°	7.27°	9.67°	3°	11°
13.	PP-TV	90.43°	1.33°	.34°	89.69°	91.17°	89°	93°
14.	SN vert UL	8.37	1.48	.38°	7.55	9.19	5	11
15.	A vert LL	2.36	2.32	.6	1.07	3.65	-1	8
16.	U I —T H	114.43°	5.87°	1.51°	111.18°	117.69°	108°	127°
17.	L I-T H	121.7°	6.59°	1.7°	117.41°	124.72°	106°	132°
18.	SN-vert/UL	3.0	1.52°	.39°	2.16°	3.84°	1°	7°
19.	SN vert/LL	.7	1.81	.46°	-.3	1.7	-3	5
20.	SN —vert-CHIN	-2.93	6.05	1.56	-6.29	.42	-12	8
21.	NASAL/Projection	15.68°	1.29	.36	14.93	16.43	14	1
22.	VIAZIS ANGLE	14.5°	3.26°	.87°	12.61°	16.38°	9.5°	19°
23.	SNA	84.07°	4.59°	1.18°	81.52°	86.61°	78°	91°
24.	SNB	79.73°	3.07°	.79°	78.03°	81.44°	75°	84°
25.	ANS	4.33°	2.35°	.60°	3.03°	5.63°	-1°	8

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TABLE -6
ANOVA TEST

Variables	Mean + S.D. Males	Range Females	Mean + S.D.	Range	Significance P Value
AB proj T H	4.46+/-1.93	1.5-8	5.16+/-2.36	-5-(9)	.382
NI_to A	1.2+/-3.1	-6-(8.5)	2.4+/-3.6	-2-(8)	.316
NI_to B	-3.27+/-4.18	-14-(4)	-2.73+/-3.36	-8-(2)	.703
NI_to Pog	-.07+/-4.5	-11-(7)	-.97+/-3.4	-7-(4)	.547
N - ANS	57.43+/-2.8	53-64	53.46+/-3.2	48.5-59	.001 sig
ANS — ME	71.6+/-5.17	63-82	65.73+/-3.57	60-72	.001sig
N-ANS/ANS-ME	.79+/-0.06	.69=.94	.80+/-0.05	.67-.90	.695
NA-T H	90.60+/-2.1°	86-94°	92.3+/-3.4°	88-98	.114
NPog-TH	89.60+/-3.05°	85-98°	89.17+/-1.8°	86-91	.640
AB-T H	5.83+/-1.78°	3-9°	7.77+/-3.91°	-1-(14)	.093
GO-GN-TH	17.33+/-4.6°	8-22.5°	20.33+/-3.91°	14.5-27	.065
NSL-TH	8.83+/-1.49°	7-11°	8.47+/-2.16°	3-11	.594
PP-TV	90.47+/-2.5°	83-93°	90.43+/-1.33°	89-93	.964
SN-VER/UL	3.17+/-1.39	-1-(6)	3+/-1.5	1-7	.757
SN-VER/LL	.20+/-2.6	-5-(5)	.70+/-1.8	-3-(5)	.548
SN-VER/CHIN	-5.80+/-3.2	-11-(1)	-5.7+/-2.84	-8-(1)	.119
NASAL/Proj	16.50+/-1.86	13-20	15.68+/-1.2	14-18	.182
VIAZIS ANGLE	12.16-2.9	6-14	14.1+/-3.2	5-11	.003sig
SNverUI	10.83+/-2.51	6-15	8.5+/-1.6	5-12.5	.001sig
AverLI	3+/-2,07	0-(6)	2.36+/-2.32	-1-(8)	.438
UI-TH	113.47+/-5.3°	103-123°	114.43+/-5.87°	108-127	.640
LI-TH	120.17+/-4.65°	111-128°	121.07+/-6.5°	106=132	.669
SNA	82.27+/-3.1°	76-88°	84.07+/-4.4°	78-91	.220
SNB	79.33+/-2.52°	74-84°	79.53+/-3°	75-84	.700
ANB	2.93+/-1.4°	1-7°	4.33+/-2.3°	-1-(8)	.060

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