

Comparison of Goans' and Caucasians' Soft Tissue Features Based on Arnett's STCA

NKS Aravind¹*PK Chandra²Sonali Rathore³ Anirudh K Mathur⁴Yashodhan K Bichu⁵ B Santhosh Reddy⁶

¹Reader, Department of Orthodontics and Dentofacial Orthopaedics, Army College of Dental Sciences, Secunderabad, India.

²Ex Professor and Head, Department of Orthodontics and Dentofacial Orthopaedics, Goa Dental College and Hospital, Goa, India.

³Senior Lecturer, Department of Orthodontics and Dentofacial Orthopaedics, Army College of Dental Sciences, Secunderabad, India.

⁴Reader, Department of Orthodontics and Dentofacial Orthopaedics, Army College of Dental Sciences, Secunderabad, India.

⁵Private Consultant, Sharjah, UAE.

⁶Reader, Department of Orthodontics and Dentofacial Orthopaedics, Meghna Institute of Dental Sciences, Nizamabad, India.

ABSTRACT

Background: Arnett and Bergmann's STCA has gained popularity among orthodontists and oral surgeons recently and being used for evaluation potential patients for orthognathic surgery. STCA norms were established for Goan population in previous article by authors. In this article we compared the norms for Goan population with those of Caucasians. 600 students from Goa medical and dental college were screened and 85 subjects were selected. Arnett's analysis was done and norms were derived. Goan norms were compared with Caucasian norms. Some important differences and similarities were noted.

Keywords:Arnett's STCA, Goans, Caucasians, Soft tissue features.

INTRODUCTION

While using any cephalometric analysis for any patient it's important to have norms derived for the cephalometric analysis which we will be using. Both hard tissue and soft tissue features differ from one ethnic group to another ethnic group. Norms derived for Caucasians should not be used directly for Goans because both populations belong to different geographic location and environments. A person's social interactions may be negatively affected if his or her facial esthetics doesn't fit into the normal range of the ethnic or racial group to which she or he belong¹. So it's of utmost importance that the facial outline and features at the end of treatment must be within the normal range of the population group to which the patient belongs to. With this in back drop we derived norms for STCA^{2,3} for Goan population. Then, we compared those norms with those of Caucasians.

MATERIALS AND METHODS

600 Students from Goa Medical College and Goa Dental College were screened. Students who met the clinical criteria were selected for the study. All subjects and their families were originally from Goa. A questionnaire was given to all students to obtain information regarding their Goan ethnicity. Total of 85 students were selected, comprising of 45 female and 40 males. Since the students were to undergo radiographic exposure, informed consent was obtained from each one. Study was approved by the ethical committee of the institution.

Clinical criteria for selection

- Subject should be of Goan origin
- Age between 18-26
- Straight facial profile
- Pleasant facial appearance
- Full complement of teeth excluding third molars

Received: May. 23, 2018; Accepted: July. 2, 2018

*Correspondence Dr. NKS Aravind.

Department of Orthodontics and Dentofacial Orthopaedics, Army College of Dental Sciences, Secunderabad, India.

Email: kalyandoc@gmail.com

- No previous orthodontic or prosthodontic treatment
- No functional deviations

Cephalometric criteria for selection

- ANB angle (anteroposterior) in a range of $2.72^{\circ} \pm 1.82^{\circ}$
- Average FMA (vertical) angle in the range of 23°

Statistical analysis

To estimate intraoperative tracing error in selecting cephalometric land marks and in measuring the linear and angular values, 15 randomly selected lateral cephalometric radiographs were retraced and remeasured after a period of 21 days by the same orthodontist. A paired t test was carried out to determine intraoperative tracing error. There was no significant difference between measurement recorded on day one and the measurements recorded after 21 days.

1. paired t-test for intraoperative error

$$\frac{(\bar{x}_1 - \bar{x}_2)}{s / \sqrt{n}}$$

$$\text{Where } s = \sqrt{\sum (di - \bar{d})^2 / n - 1}$$

and di is the difference formed for each pair of observations

X_1 -mean of first set of measurements

X_2 - mean of measurements recorded after 21 days

Statistical analysis of the differences between males and females was done with t testing. A level of significance of 5% was assigned and P values were determined.

Statistical analysis of the differences between Caucasian males and Goan males and again between Caucasian females and Goan females was done by t testing.

$$t = \frac{|\bar{x}_1 - \bar{x}_2|}{SE(\bar{x}_1 - \bar{x}_2)}$$

$$SE(\bar{x}_1 - \bar{x}_2) = SD \sqrt{\left\{ \frac{1}{n_1} + \frac{1}{n_2} \right\}}$$

x_1 = mean of sample one

x_2 = mean of sample two

n_1 = number of individuals in sample one

n_2 = number of individuals in sample two

Table 1: Goan norms for STCA.

Parameter	Goan Male		Goan Female		P Value	Difference is significant if p is <0.05
	Mean	S.D.	Mean	S.D.		
Dentoskeletal Factors						
projections						
Mx1 to TVL	-9.5	2.81	-8.8	2.28	0.0010	highly significant
Mx1 to Mx occlusal plane	55.5	4.80	56.8	3.57	0.1449	not significant
Overjet	3.1	0.84	3.2	0.80	0.5611	not significant
Md1 to TVL	-12.5	2.73	-11.5	1.80	0.0089	highly significant
Md1 to Md occlusal plane	59.5	4.29	60.1	5.95	0.6250	not significant
Heights or lengths						
Mx1 exposure	2.6	1.35	3.8	1.62	0.0004	highly significant
Overbite	3.0	1.00	2.9	0.97	0.4753	not significant
Mandibular Height	50.2	3.68	46.3	5.82	0.0004	highly significant
Maxillary posterior	97.8	3.56	98.2	3.99	0.6319	not significant

height						
Soft Tissue thicknesses						
Upper Lip thickness	14.3	2.12	12.6	1.35	0.0000	highly significant
Lower lip Thickness	15.0	2.00	13.7	1.67	0.0017	highly significant
Pog – Pog'	13.1	1.11	12.8	1.75	0.2760	not significant
Me – Me'	8.6	1.29	8.1	1.78	0.1566	not significant
Facial heights or lengths						
Soft tissue						
Upper lip length	22.1	3.21	19.1	3.51	0.0001	highly significant
Interlabial gap	0.8	1.17	1.5	1.95	0.0433	significant
Mx1 exposure	2.6	1.35	3.8	1.62	0.0004	highly significant
Lower lip length	49.4	3.73	44.8	3.73	0.0000	highly significant.
Lower 1/3 of face	72.6	5.79	65.5	4.49	0.0000	highly significant
Nasion'- Me'	131.1	5.45	120.2	6.62	0.0000	highly significant
Hard tissue						
Maxillary Height	24.7	3.16	23.0	2.75	0.0097	highly significant
Overbite	3.0	1.00	2.9	0.97	0.4753	not significant
Mandibular Height	50.2	3.68	46.3	5.82	0.0004	highly significant
Maxillary posterior height	97.8	3.56	98.2	3.99	0.6319	not significant
Projection to TVL						
High midface projections						
Glabella	-5.2	2.81	-4.8	3.06	0.5921	not significant
Orbital rim	-23.9	2.73	-20.6	2.69	0.0000	highly significant
Cheek bone	-28.5	3.16	-24.6	2.77	0.0000	highly significant
Subpupil	-18.3	3.25	-15.8	2.59	0.0001	highly significant.
Maxillary projections						
Nasal projection	16.2	1.85	14.2	1.93	0.0000	highly significant
Alar base	-12.5	4.55	-10.9	1.76	0.0324	significant
A point'	-1.8	1.23	-1.4	1.34	0.1787	not significant
Mx1	-9.5	2.81	-8.8	2.28	0.0010	highly significant
Upper lip anterior	2.2	2.51	2.6	1.69	0.3568	not significant
Upper lip Angle	9.4	10.08	11.0	7.68	0.4046	not significant
Nasolabial Angle	95.1	16.57	95.2	12.71	0.9653	not significant
Mandibular projection						
Md1	-12.5	2.73	-11.5	2.46	0.0089	highly significant
Lower lip anterior	-0.1	3.18	-0.0	2.38	0.8175	not significant
B' point	-9.9	3.57	-9.0	3.15	0.2388	not significant
Pog'	-6.2	3.25	-6.5	3.34	0.7416	not significant
Throat length (neck throat point to Pog')	56.3	4.93	56.5	5.03	0.8381	not significant
Harmony values						
Total facial harmony						
Facial angle	167.3	5.67	168.8	5.42	0.2189	not significant
Glabella – A 'point	3.5	2.82	3.4	2.80	0.8972	not significant
Glabella – Pog'	-0.5	3.85	-0.5	4.33	0.9938	not significant
Orbit to jaws						

Orbital rim' – A point'	22.5	3.11	19.1	3.02	0.0000	highly significant
Orbital rim' – Pogonion'	18.6	4.44	14.1	4.05	0.0000	highly significant
Maxilla to mandible harmony						
Subnasale- Pog'	6.2	3.24	6.5	3.31	0.6113	not significant
A' point- B' point	7.3	3.32	7.1	3.01	0.7659	not significant
Upper lip anterior-lower lip anterior	3.08	2.92	4.2	4.51	0.1551	not significant
Intramandibular relation						
Md1- Pog'	6.3	3.15	6.6	2.95	0.6697	not significant
Lower lip anterior-Pog'	5.2	3.34	6.1	2.88	0.1848	not significant
B' point- Pog'	3.3	1.67	2.7	1.44	0.0530	not significant

Table 2: Comparison of Goans and Caucasian males.

Parameter	Goan male		Caucasian Male		P Value	Difference is significant when p is <0.05
	Mean	SD	Mean	SD		
Dentoskeletal Factors						
projections						
Mx1 to TVL	-9.5	2.81	-12.1	1.8	3.24E-05	highly significant
Mx1 to Mx occlusal plane	55.5	4.80	57.8	3.0	0.02562	significant
Overjet	3.1	0.84	3.2	.6	0.8427	not significant
Md1 to TVL	-12.5	2.73	-15.4	1.9	2.96E-06	highly significant
Md1 to Md occlusal plane	59.5	4.29	64.0	4.0	0.00201	highly significant
Heights or lengths						
Mx1 exposure	2.6	1.35	3.9	1.2	0.0002	highly significant
Overbite	3.0	1.00	3.2	.7	0.5271	not significant
Mandibular Height	50.2	3.68	56.0	3.0	3.91E-10	highly significant
Maxillary posterior height	97.8	3.56	95	1.4	1.77E-05	highly significant
Soft Tissue thicknesses						
Upper Lip thickness	14.3	2.12	14.8	1.4	0.1778	not significant
Lower lip Thickness	15.0	2.00	15.1	1.2	0.5962	not significant
Pog – Pog'	13.1	1.11	13.5	2.3	1	not significant
Me – Me'	8.6	1.29	8.8	1.3	0.573	not significant
Facial heights or lengths						
Soft tissue						
Upper lip length	22.1	3.21	24.4	2.5	1.4E-193	highly significant
Interlabial gap	0.8	1.17	2.4	1.1	7.45E-07	highly significant
Mx1 exposure	2.6	1.35	3.9	1.2	0.0002	highly significant
Lower lip length	49.4	3.73	54.3	2.4	4.69E-09	highly significant
Lower 1/3 of face	72.6	5.79	81.1	4.7	3.4E-09	highly significant
Nasion' - Menton'	131.1	5.45	137.7	6.5	0.0001	highly significant
Hard tissue						
Maxillary Height	24.7	3.16	28.4	3.2	0.0002	highly significant

Overbite	3.0	1.00	3.2	.7	0.5901	not significant
Mandibular Height	50.2	3.68	56.0	3.0	3.91E-10	highly significant
Maxillary posterior height	97.8	3.56	95	1.4	1.77E-05	highly significant
Projection to TVL						
High midface projections						
Glabella	-5.2	2.81	-8	2.5	0.0001	highly significant
Orbital rim	-23.9	2.73	-22.4	2.7	0.035	significant
Cheek bone	-28.5	3.16	-25.2	4.0	1.43E-13	highly significant
Subpupil	-18.3	3.25	-18.4	1.9	0.9402	not significant
Maxillary projections						
Nasal projection	16.2	1.85	17.4	1.7	0.017	significant
Alar base	-12.5	4.55	-15.0	1.7	0.003	highly significant
A' point	-1.8	1.23	-.3	1.0	6.46E-07	highly significant
Mx1	-9.5	2.81	-12.1	1.8	3.24E-05	highly significant
Upper lip anterior	2.2	2.51	3.3	1.7	0.0572	not significant
Upper lip Angle	9.4	10.08	8.3	5.4	0.5759	not significant
Nasolabial Angle	95.1	16.57	106.4	7.7	0.003	highly significant
Mandibular projection						
Md1	-12.5	2.73	-15.4	1.9	2.96E-06	highly significant
Lower lip anterior	-0.1	3.18	1.0	2.2	0.1004	not significant
B' point	-9.9	3.57	-7.1	1.6	3.94E-05	highly significant
Pog'	-6.2	3.25	-3.5	1.8	3.36E-05	highly significant
Throat length (neck throat point to Pog')	56.3	4.93	61.4	7.4	0.0057	highly significant
Facial Harmony						
Total facial harmony						
Facial angle	165.3	5.67	169.4	3.2	0.1396	not significant
Glabella – A' point	3.5	2.82	7.	2.8	6.48E-08	highly significant
Glabella – Pog'	-0.5	3.85	4.6	2.2	3.81E-09	highly significant
Orbit to jaws						
Orbital rim' – A' point	22.5	3.11	22.1	3	0.614	not significant
Orbital rim' – Pog'	18.6	4.44	18.9	2.8	0.8070	not significant
Maxilla to mandible harmony						
Subnasale- Pog'	6.2	3.24	4.0	1.7	0.0005	highly significant
A' point- B' point	7.3	3.32	6.8	1.5	0.3781	not significant
Subnasale- Pog'	3.08	2.92	2.3	1.2	0.1454	not significant
Intramandibular relation						
Md1- Pog'	6.3	3.15	11.9	2.8	7.28E-11	highly significant
Lower lip anterior- Pog'	5.2	3.34	4.4	2.5	0.259063	not significant
B' point- Pog'	3.3	1.67	3.6	1.3	0.5586	not significant

Table 3: Comparison of Goan and Caucasian females.

Parameter	Goan female		Caucasian female		P Value	Difference is significant when p is <0.05
	Mean	SD	Mean	SD		
Dentoskeletal Factors						
projections						
Mx1 to TVL	-8.8	2.28	-9.2	2.2	0.4611	not significant
Mx1 to Mx occlusal plane	56.8	3.57	56.8	2.5	1	not significant
Overjet	3.2	0.80	3.2	0.4	1	not significant
Md1 to TVL	-11.5	1.80	-12.4	2.2	0.2903	not significant
Md1 to Md occlusal plane	60.1	5.95	64.3	3.2	0.0001	highly significant
Heights or lengths						
Mx1 exposure	3.8	1.62	4.7	1.6	0.02392	significant
Overbite	2.9	0.97	3.2	0.7	0.1769	not significant
Mandibular Height	46.3	5.82	48.6	2.4	0.61198	not significant
Maxillary posterior height	98.2	3.99	95.6	1.8	6.27E-05	highly significant
Soft Tissue thicknesses						
Upper Lip thickness	12.6	1.35	12.6	1.8	1	not significant
Lower lip Thickness	13.7	1.67	13.6	1.4	1	not significant
Pog – Pog'	12.8	1.75	11.8	1.5	0.01	significant
Me – Me'	8.1	1.78	7.4	1.6	0.0839	not significant
Facial heights or lengths						
Soft tissue						
Upper lip length	19.1	3.51	21.0	1.9	0.00341	highly significant
Interlabial gap	1.5	1.95	3.3	1.3	1.66E-06	highly significant
Mx1 exposure	3.8	1.62	4.7	1.6	0.02392	significant
Lower lip length	44.8	3.73	46.9	2.3	0.003524	highly significant
Lower 1/3 of face	65.5	4.49	71.1	3.5	1.25E-08	highly significant
Nasion'- Me'	120.2	6.62	124.6	4.7	0.002063	highly significant
Hard tissue						
Maxillary Height	23.0	2.75	25.7	2.1	4.63E-06	highly significant
Overbite	2.9	0.97	3.2	0.7	0.1769	not significant
Mandibular Height	46.3	5.82	48.6	2.4	0.611987	not significant
Maxillary posterior height	98.2	3.99	95.6	1.8	6.27E-05	highly significant
Projection to TVL						
High midface projections						
Glabella	-4.8	3.06	-8.5	2.4	3.55E-08	highly significant
Orbital rim	-20.6	2.69	-18.7	2.0	0.0006	highly significant
Cheek bone	-24.6	2.77	-20.6	2.4	6.7E-165	highly significant
Subpupil	-15.8	2.59	-14.8	2.1	0.109823	not significant
Maxillary projections						
Nasal projection	14.2	1.93	16.0	1.4	8.08E-06	highly significant

Alar base	-10.9	1.76	-12.9	1.1	1.32E-08	highly significant
A' point	-1.4	1.34	-0.1	1.0	5.66E-06	highly significant
Mx1	-8.8	2.28	-9.2	2.2	0.461195	not significant
Upper lip anterior	2.6	1.69	3.7	1.2	0.000444	highly significant
Upper lip Angle	11.0	7.68	12.1	5.1	0.508807	not significant
Nasolabial Angle	95.2	12.71	103.5	6.8	0.00041	highly significant
Mandibular projection						
Md1	-11.5	2.46	-12.4	2.2	0.290396	not significant
Lower lip anterior	-0.0	2.38	1.9	1.4	2.71E-05	highly significant
B' point	-9.0	3.15	-5.3	1.5	3.09E-14	highly significant
Pog'	-6.5	3.34	-2.6	1.9	1.67E-09	highly significant
Throat length	56.5	5.03	58.2	5.9	0.218808	not significant
Facial Harmony						
Total facial harmony						
Facial angle	168.8	5.42	169.3	3.4	0.632848	not significant
Glabella – A' point	3.4	2.80	8.4	2.7	2.12E-12	highly significant
Glabella – Pog'	-0.5	4.33	5.9	2.3	1.88E-14	highly significant
Orbit to jaws						
Orbital rim' – A' point	19.1	3.02	18.5	2.3	0.347409	not significant
Orbital rim' – Pog'	14.1	4.05	16	2.6	0.016197	significant
Maxilla to mandible harmony						
Subnasale- Pog'	6.5	3.31	3.1	1.9	2.09E-07	highly significant
A' point- B' point	7.1	3.01	5.2	1.6	0.000618	highly significant
Subnasale- Pog'	4.2	4.51	1.8	1.0	0.000702	highly significant
Intramandibular relation						
Md1- Pog'	6.6	2.95	9.8	2.6	2.98E-06	highly significant
Lower lip anterior- Pog'	6.1	2.88	4.5	2.1	0.006835	highly significant
B' point- Pog'	2.7	1.44	2.7	1.1	1	not significant

RESULTS

STCA was done for the entire sample and their means, standard deviations were obtained. Some similarities were found between Goan males and females. There were some differences and similarities between Goans and Caucasians. All the results are displayed in the Tables.

DISCUSSION

STCA is divided into five parts.

1. Dentoskeletal factors
2. Soft tissue thickness
3. Facial heights or lengths
4. True vertical line projections

5. Harmony values

Dentoskeletal factors

Dentoskeletal factors are again divided into 2 areas dentoskeletal projections and heights. Soft tissue profile at the end of the treatment depends on how well these factors are managed by the orthodontist and the oral surgeon.

When compared to Caucasians, Goan males have more prominent and proclined incisors. Even then the measurement of upper lip prominence is similar in Goan and Caucasian males. This is possibly due to the fact that occlusal plane itself is steep in Goan males. Hence lip support in Goan males is similar to Caucasians. Both Goan males and females have

more proclined lower incisors than their Caucasian counterparts. Hence their intramandibular harmony values differ from Caucasians. The horizontal distance between lower incisor tip and Pogonion is more in Goans. Goan males have short upper lip than Caucasian males, but still have less maxillary incisor exposure. This is because of the fact that Goan males also have a shorter anterior maxillary height than Caucasian males. Goan males and females have steeper occlusal plane than Caucasians. Steeper occlusal plane means a tendency toward convex facial profile and decreased chin prominence exists in Goans.

Soft tissue thickness

Soft tissue thickness over Pogonion is more in Caucasian females compared to Goan females. Lower lip is supported better in Caucasian females. And this also can be a reason for increased anteroposterior distance between lower lip and Pog' in Goan females compared to Caucasian females.

Facial heights or lengths

Caucasians showed higher values for all 6 soft tissue parameters than Goans. Caucasians have longer faces than Goans. Goan females showed shorter dimensions for all the above parameters except interlabial gap and maxillary incisor exposure compared to Goan males. Same pattern is observed in Caucasians. Greater maxillary incisor exposure at rest gives a youthful appearance to face.

True vertical line projections

Goans have more prominent glabella, which might result in chin appearing more deficient than what it is.

Goans males and females have prominent glabella and deficient chin compared to their Caucasian counterparts which gives a clinical impression of convex face and prominent maxilla. But when mid face projections are evaluated, it becomes clear that it is not so. Goan males and females have less prominent maxilla than Caucasians as indicated by orbital rim and cheek bone prominence. Caucasians have larger nasolabial angle than Goans. Small nasolabial angle in Goans can't be due to lip position as the upper lip prominence is similar between Goans and Caucasians. It can be due to variation in

nasal tip contour between Goans and Caucasians. Caucasians have more prominent chin than Goans. There can be two reasons for it; one, soft tissue thickness over Pogonion and second, orientation of mandible. The first reason can be ruled out, because Goan males have similar soft tissue thickness as Caucasian males and Goan females have more soft tissue thickness over pogonion than Caucasian females. Difference in orientation of the mandible can be a reason because it is influenced by maxillary occlusal plane angle, which is more in Goans when compared to Caucasians. A higher occlusal plane angle will force the mandible backwards and reduce effective chin. Caucasian males have more throat length than Goan males. Any treatment procedure which steepens the occlusal plane or rotates the mandible downward and backward should be avoided in Goans.

Harmony values

Harmony values were created to measure the balance and harmony between the facial structures. Harmony or balance between different facial landmarks is an important component of facial beauty. Harmony values are the horizontal distances between two landmarks, measured perpendicular to True Vertical Line.

Total facial harmony

No significant difference between Caucasians and Goans for facial angle. it means that on a whole the relation between upper face, mid face and lower face is the same in two populations. **In Caucasians the horizontal distance between upper jaw and forehead is more when compared to Goans.** This is because of two factors: in Goans, Glabella is more prominent and point A' is less prominent than Caucasians. Both Goan males and females have less prominent chin than Caucasians. In Goans, chin is either in line with Glabella or slightly behind it. Hence Goans' face might appear convex due to less prominent chin.

Maxilla to mandible harmony

The horizontal distance between Subnasale and Pog' is more in Goans than in Caucasians. This is due to the fact that Pog' is less prominent in Goan males. The horizontal distance between soft tissue A point and soft tissue B point is more in Goan females than in Caucasian females. This can be due to the fact

that soft tissue B point is more prominent in Caucasian females.

- Three factors do need consideration. In comparison to Caucasian females, Goan females have posteriorly placed point A', still more posteriorly placed point B' and increased distance between point A' and point B'. It indicates that in Goan females, the lower third of the face diverges posteriorly.

The horizontal distance between upper lip anterior and lower lip anterior measured from true vertical line is more in Caucasian females than in Goans.

Intramandibular harmony

The horizontal distance is more in Caucasian males and females than in Goans. This can be due to two factors: first, the mandibular incisor is more prominent in Goans. Second, Pog' is less prominent in Goans compared to Caucasians. The anteroposterior distance between lower lip and chin is similar between Goan males and females and also between Goan males and Caucasian males. The anteroposterior distance between lower lip and chin is more in Goan females compared to Caucasian females. It indicates that the lower third of the face in Goan females show posterior divergence compared to Caucasian females, and same inference was obtained while evaluating inter jaw harmony. B' point- Pog' gives an indication about soft tissue chin contour and mento-labial sulcus. Higher the value more clear is the soft tissue chin outline. Chin contour is similar between Goans and Caucasians. This fact indicates that decreased chin prominence in Goans might not be due to chin contour itself, it might be due to other factors such as steepness of occlusal plane.

CONCLUSION

Soft tissue profile of Goans was evaluated according to Arnett's Soft Tissue Cephalometric Analysis and norms were derived for males and females separately. Goan males were compared to Caucasian males. Goan females were compared to Caucasian females. The following conclusions could be drawn from the present study.

COMPARISON OF GOAN MALES AND CAUCASIAN MALES:

- In Goan males glabella is more prominent, chin is less prominent, occlusal plane is steeper and throat length is less. Hence chin appears deficient in Goan males in comparison to Caucasian males. Hence any surgical procedure which will reduce chin projection is better avoided in Goans.
- In Goan males upper jaw is located more posteriorly in relation to forehead.
- Incisors are more prominent and proclined in Goan males.
- Soft tissue thickness is similar in Goan males and Caucasian males.
- In vertical direction Goan males have short faces than Caucasian males.

COMPARISON OF GOAN FEMALES AND CAUCASIAN FEMALES:

- In Goan females, Glabella is more prominent, chin is less prominent and occlusal plane is steeper. Hence, chin appears deficient in Goan females in comparison to Caucasian females. Hence any surgical procedure which will reduce chin projection is better avoided in Goan females.
- Jaws are positioned more posteriorly in relation to forehead in Goans.
- In Goan females, the anteroposterior difference between maxilla and mandible is more compared to Caucasian females.
- Chin contour is similar in both populations. But chin is positioned posteriorly in relation to mandibular incisors and lower lip in Goan females.
- Lower incisors are more proclined in Goan females.
- Soft tissue thicknesses are similar between Goan females and Caucasian females.
- Facial heights are significantly smaller in Goans than Caucasians.

Final conclusion – analysis of soft tissue profile of patients of Goan origin and their treatment planning should be done according to the norms developed for Goans. Caucasian norms should not be applied since they differ from Caucasians on many accounts.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

REFERENCES

1. Shaw WC. The influence of children's dentofacial appearance on their social attractiveness as judged by peers and lay adult. Am J Orthod: 79; 399-415, 1981
2. Arnett GW, Bergman RT: Facial keys to orthodontic diagnosis and treatment planning Part I Am J Orthod Dentofacial Orthop 103:299-312,1993.
3. Arnett GW, Bergman RT: Facial keys to orthodontic diagnosis and treatment planning Part II Am J OrthodDentofacOrthop 395-411,1993.