

Soft Tissue Cephalometric Norms of Various Ethnic Groups in North India: A Systematic Review

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Abstract

Facial features play a key role in determining the esthetic attractiveness of a person. Cephalometric analysis paves way to have a guide to plan a treatment to bring aesthetically pleasing results. Soft tissue cephalometric analysis is helpful as guides while planning orthodontic, surgical, aesthetic procedures. However, since earliest cephalometric analysis are based solely on studies done on Caucasian population some key features may not be quite appealing while the results are applied to Indian ethnic population groups as standards of beauty varies depending on the ethnicity of the viewer and the bearer. Hence while planning aesthetically pleasing treatments, one might make use of soft tissue cephalometric studies done on specific ethnic populations to which the patient belongs. This article provides a systematic review and comparison of such soft tissue cephalometric studies done on ethnic north Indian populations to standard Caucasian values.

Keywords: Cephalometric analysis, ethnic facial study, soft tissue analysis, facial proportions, soft tissue cephalometric study, Indian facial analysis

INTRODUCTION

Facial features play a great role in determining the attractiveness of a person in general. Any aesthetic procedure and sometimes even functional or essential surgical procedures are performed with utmost care to preserve existing aesthetic features and to prevent development of any undesirable scar tissue or permanent defects [1–3]. Historically artists first developed basic norms for drawing aesthetic human figures. Most of the treatment plans followed by Orthodontists, Oral Surgeons and even some plastic and reconstructive surgeons are based on cephalometric analysis developed by Orthodontists which give us the norms for shaping and treating certain anatomic features. This article is a systematic review and compilation of various soft tissue cephalometric analysis that are done on various north Indian ethnic population groups [4–6].

MATERIALS AND METHODS

In the “PubMed”, “Medline” electronic database systems 18 articles were found from 1994–2024 when keywords as “soft tissue”, “cephalometric analysis”, “Indian population”, “ethnic study” were used to search. Of these articles original study of soft tissue parameters in cephalometric images were selected for whichever ethnic populations they were available (Tables 1-3). This gave me a set of 3 articles which had soft tissue cephalometric values of ethnic population groups in India which fell under the inclusion criteria and had compared the study results with an existing Caucasian soft tissue cephalometric analysis [7–9].

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Inclusion Criteria

- The study sample consists of individuals from Indian ethnic population groups.

- The study involves a comparison with at least one soft tissue cephalometric analysis based on Caucasian population norms.
- The sample population exhibits pleasing facial features.
- Participants have a Class I molar relationship with minimal crowding or spacing.
- Participants have no history of orthodontic treatment, prosthetic interventions, or facial surgical procedures.
- A standard cephalometric machine was used for data collection.

Exclusion Criteria

- Improper sample selection.
- Study values not compared to any standard cephalometric analysis.
- People with skeletal or dental discrepancy included in the sample.
- No details available on the X-ray machine used.

Table 1. Chhattisgarh Population (Legan and Burstone analysis).

Variables		Caucasian		North Indian		P value
		Mean	SD	Mean	SD	
<i>Facial Form</i>						
Facial convexity angle	G–Sn–Pg0 (angle)	12	4	14.3	5.42	0.016
Maxillary prognathism	G–Sn (II HP)	6	3	6.69	4.52	0.37
Mandibular prognathism	G–Pg0 (II HP)	0	4	–0.21	7.25	0.86
Vertical height ratio	G–Sn/Sn–Me0 (Perp. HP)	1	–	1.03	–	–
Lower face throat angle	Sn–Gn0–C (angle)	100	7	112.75	11.73	<0.001
Lower vertical height-depth ratio	Sn–Gn0 /C–Gn0	1.2	–	1.25	–	–
<i>Lip position and form</i>						
Nasolabial angle	Cm–Sn–Ls (angle)	102	8	112.14	10.85	<0.001
Upper lip protrusion	Ls–(Sn–Pg0)	3	1	2.59	2.82	0.37
Lower lip protrusion	Li–(Sn–Pg0)	2	1	1.99	2.64	0.98
Mentolabial sulcus	Si–(Li–Pg0)	4	2	4.97	3.42	0.1
Vertical lip chin ratio	Sn–Stms/Stmi–Me(Per HP)	0.5	–	0.45	–	–
Maxillary incisor exposure	Stms-1	2.0	2	2.45	1.99	0.23
Interlabial gap	Stmi–Stms (Perp. HP)	2.0	1	0.43	0.89	<0.001

Table 2. Western Indian Population (Aenett's analysis).

Variables		Caucasian		Chhattisgarh		P value
		Mean	SD	Mean	SD	
<i>Facial Form</i>						
Facial convexity angle	G–Sn–Pg0 (angle)	12	4	13.7859	5.9415	0.0934
Maxillary prognathism	G–Sn (II HP)	6	3	6.6481	4.6184	0.4278
Mandibular prognathism	G–Pg0 (II HP)	0	4	9.2826	5.4925	0.0001
Vertical height ratio	G–Sn/Sn–Me0 (Perp. HP)	1	–	1.0714	0.8643	0.6031
Lower face throat angle	Sn–Gn0–C (angle)	100	7	112.5129	27.5383	0.0058
Lower vertical height-depth ratio	Sn–Gn0 /C–Gn0	1.2	–	8.1616	27.5569	0.1137
<i>Lip position and form</i>						
Nasolabial angle	Cm–Sn–Ls (angle)	102	8	95.4344	17.4173	0.0265
Upper lip protrusion	Ls–(Sn–Pg0)	3	1	6.0937	2.9609	0.0001
Lower lip protrusion	Li–(Sn–Pg0)	2	1	6.0309	4.3498	0.0001
Mentolabial sulcus	Si–(Li–Pg0)	4	2	–0.2666	5.8981	0.0001
Vertical lip chin ratio	Sn–Stms/Stmi–Me(Per HP)	0.5	–	0.44987	0.06421	0.0001
Maxillary incisor exposure	Stms-1	2.0	2	3.6564	2.9261	0.0019
Interlabial gap	Stmi–Stms (Perp. HP)	2.0	1	4.3377	3.3877	0.0001

Table 3. Western Indian Population (Aenett's analysis).

Variables	Caucasian Female		Caucasian Male		Western Indian (UP) Female		Western Indian (UP) Male		P value
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Upper lip thickness	12.6	1.8	14.8	1.4	13.68	0.73	14.94	1.18	M:0.7515 F:0.424
Lower lip thickness	13.6	1.4	15.1	1.2	12.59	0.87	14.09	1.13	M:0.0146 F:0.0113
Pog-Pog'	11.8	1.5	13.5	2.3	12.29	1.58	14.34	1.81	M:0.2409 F:0.3111
Menton-Menton	7.4	1.6	8.8	1.3	7.91	0.80	9.50	1.15	M:0.1005 F:0.2313
Nasolabial angle	103.5	6.8	106.4	7.7	102.68	9.74	102.44	8.96	M:0.163F: 0.7464
Upper lip angle	12.1	5.1	8.3	5.4	6.32	3.47	5.59	4.22	M:0.1094 F:0.0002

DISCUSSION

It is no news that different population groups have different facial features. The statistical differences between the cephalometric values of any population group when compared to the standard Caucasian population has been proven to be of significant value. Similarly, studies have shown statistically significant variations between the average soft and hard tissue cephalometric parameters obtained from Caucasian population [1–5]. Comprehensive cephalometric and facial analyses allow us to identify the structural etiology of the malocclusion and plan the treatment accordingly [6]. Soft tissue analysis helps in enhancing the facial esthetic results of the patient's treatments [7–10].

North Indian Population

The study observed that the facial convexity angle was greater in the North Indian population, indicating a more convex facial profile compared to Caucasians (Table 1). Among North Indians, males displayed a higher degree of facial convexity than females (Table 1). Additionally, the lower face-throat angle was more obtuse in North Indians than in Caucasians (Table 1). A statistically significant difference was also noted in the nasolabial angle, which was more obtuse in the North Indian group (Table 1). Furthermore, the interglacial gap in North Indians was significantly shorter than that in Caucasians. Overall, the comparative analysis highlighted that the soft tissue profiles of North Indians closely resembled those of Caucasians [1, 4, 5].

Chhattisgarh Population

The study found that the facial convexity angle, maxillary-mandibular prognathism, and lower face-throat length were greater in the Chhattisgarh population compared to Caucasians (Table 2). In contrast, the nasolabial angle, dentilabial sulcus, and vertical lip-to-chin ratio were lower in the Chhattisgarh group than in the Caucasian population (Table 2). Interestingly, these findings for soft tissue parameters differed from those reported in studies on Central Indian and North Indian populations (Table 2). Additionally, statistically significant differences were observed in upper and lower lip protrusion, maxillary incisor exposure, and the inter-labial gap [2, 4, 5].

Western Indian Population

Western Indian females were found to have thicker upper lips and thinner lower lips compared to Caucasian females (Table 3). Additionally, the upper lip angle was lower among females in the Western Indian group. In males, the lower lips were thinner than those of their Caucasian counterparts (Table 3). These findings indicate that the lips of Western Indian females were more retro-positioned compared to those of Caucasian females [3, 6, 7].

CONCLUSIONS

People of north Indian origin have significantly different facial features even when compared to another group of people from the same Indian ancestry if there is a difference in their ethnicity. This

article compiles all such variations in a standardized format so that it can be used to modify the treatment plan while designing a facial aesthetic/orthodontic/orthognathic procedure for people from these ethnicities. The drastically significant p value differences between Caucasian and north Indian population are quite significant in planning minor cosmetic/aesthetic procedures.

Conflicts of Interest

None declared.

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