

# Facial esthetics in a selected Saudi population

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## ABSTRACT

**Objective:** The purpose of this study is to analyze the soft tissue cephalometric norms of the Saudi population and to evaluate whether significant cephalometric soft tissue differences exist between Saudi and Caucasian population.

**Methods:** Lateral cephalometric radiographs of 40 selected Saudis with esthetically pleasing faces (20 males and 20 females). The study was carried out in the College of Dentistry, King Saud University, Riyadh, Kingdom of Saudi Arabia between 1999–2001. The age range between 20 and 30 years was analyzed using Burstone system of soft tissue analysis. The means, standard deviations and ranges of the measurements were compared between males and females, and both figures correlated with the results obtained for a Caucasian population.

**Results:** Statistically, the facial convexity angle (glabella-subnasale-soft tissue pogonion) was found to be less convex for the Saudi group; the maxillary prognathism was more anterior, and the upper and lower lip positions were more anterior.

**Conclusion:** The results of the present study are significant, and showed that the normal Saudis have a slightly lesser obtuse nasolabial angle, and a more anteriorly positioned upper and lower lips. These results have a clinical implication in the diagnosis and treatment of adult Saudis with dentofacial deformities.

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One of the primary goals of orthodontic treatment is to attain and preserve optimal facial attractiveness.<sup>1</sup> To accomplish this, it is important that the orthodontist conduct a thorough facial examination so that the orthodontic correction will not adversely affect the normal facial traits. Treatment planning for patients who require orthognathic surgery should include both a hard and soft tissue cephalometric analysis, which will show the nature of the existing skeletal discrepancy. It is incomplete in providing information concerning the facial form and proportions of the patients, and in many instances, may actually be misleading. The soft tissue covering the teeth and bone is highly variable in its thickness, and this variation is also found in the position and size of the teeth and bones. As a result, hard tissue measurements can deviate considerably for the facial

form, which the patient expresses with the soft tissue. Patients may appear either more or less convex in their profile than is indicated by either hard tissue or teeth. There are differences in thickness of soft tissues, particularly at the junction of the nose and upper lip and in the region of the chin. Similarly, lips may be more protrusive or retrusive than indicated by dento-skeletal measurements due to lips that are either excessively thick or thin. At present, large numbers of Saudi adults are seeking orthodontic treatment and orthodontic surgery in the Kingdom of Saudi Arabia (KSA) as well as overseas. Therefore, a need has arisen for more accurate and comprehensive soft tissue cephalometric parameters of our group. In addition to the esthetic plane proposed by Ricketts<sup>2</sup> and the Legan and Burstone<sup>3</sup> soft tissue analysis for orthodontic surgery,

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detailed cephalometric soft tissue analysis have been reported by Epker et al<sup>4</sup> and Holdaway.<sup>5</sup> These analyses have been extensively used for research and clinical purposes. However, due to its normative values obtained from these analysis, based on Caucasian samples, they may not be applicable as a reference for the diagnosis and treatment of Saudi patients. Therefore, we applied these soft tissue analysis to a representative sample of Saudis with highly esthetically pleasant profiles in order to identify the values for soft tissue profiles that can be used as guidelines in the diagnosis and treatment planning of Saudi adults contemplating orthodontic care or orthognathic surgery.

**Methods.** Forty adult patients were selected from the College of Dentistry, King Saud University, Riyadh, KSA. They are 20 males and 20 females between the ages of 20 and 30. All the patients in the samples were with Class I molar and canine Angle's relation with no previous orthodontic treatment or orthognathic surgery, no anterior or posterior prosthetic (fixed or removable) tooth replacement, pleasing profile and with no traumatized lip. Clinical examinations including crown length, incisor at rest, horizontal and vertical overlap was carried out for the entire sample using periodontal probe and orthodontic rulers. Lateral cephalometric radiographs were taken for the entire sample in a natural head position, with the teeth in maximum intercuspation and lips in repose. All the radiographs were traced by the author and reviewed by another colleague for accurate landmark identification using Burstone<sup>6</sup> system of soft tissue analysis with the following soft tissue landmarks: (**Figure 1**) 1. Glabella (G) - the most prominent point in the mid-sagittal plane of the forehead. 2. Columella point (Cm) - the most anterior point on the columella of the nose. 3. Subnasale (Sn) - the point at which the nasal septum merges with the upper cutaneous lip in the mid-sagittal plane. 4. Labrale superius (Ls) - a point indicating the mucocutaneous border of upper lip. 5. Stomion superius (Stms) - the lowermost point on the vermilion of the upper lip. 6. Stomion inferius (Stmi) - the uppermost point on the vermilion of the lower lip. 7. Labrale inferius (Li) - a point indicating the mucocutaneous border of the lower lip. 8. Mentolabial sulcus (Si) - the point of greatest concavity in the midline between the lower lip (Li) and chin. 9. Soft tissue pogonion (Pg') - the most anterior point on soft tissue chin. 10. Soft tissue gnathion (Gn') - the constructed mid-point between Pg' and soft tissue menton; can be located at the intersection of the Sn to Pg' line and the line from C to M. 11. Soft tissue menton (Me') - lowest point on the contour of soft tissue chin; found by dropping a perpendicular from horizontal plane through menton. 12. Cervical point (C) - the innermost point between the sub-mental area and the neck located at the intersection of lines drawn tangent to the neck and sub-mental areas. 13. Horizontal reference plane (HP) - constructed by drawing a line through nasion 7 degrees up from sella (S) nasion (N) line.

**Results.** With regard to the specifics of this study, the criteria for inclusion was subjectively pleasing esthetics with the parameters listed earlier. Forty selected Saudi adults, (20 males and 20 females), met the criteria. **Table 1** contains the findings of this study including the maximum, minimum and mean group values of the soft tissue variables for the Saudi males and females. **Table 2** contains the comparison data for the Saudi male and female groups. **Table 3** shows the cephalometric values of the normal Saudi adults compared with the Caucasian population group (Legan and Burstone<sup>3</sup>). As a whole, the angles of convexity of the soft tissue excluding the nose, tended to be smaller in the Caucasian group indicating a relatively straighter facial profile. Statistically, the following differences were noted in the facial form; the facial convexity angle (G-Sn-Pg') was found to be less convex in the Saudi group; the maxillary prognathism in Saudis was more anterior, and the upper and lower lips positions were found to be more anterior. The labiomental sulcus is measured from the depth of the sulcus perpendicular to the Li-Pg' line. The lower third of the face (Sn-Me) can be divided into 3: the length of the upper lip, or the distance Sn-Stms, should be approximately one-third of the total, and the distance Stmi-Me should be approximately two-thirds. Stated another way, the ratio of Sn-Stms to Stmi-Me should be 1:2. The distance of the upper lip to the maxillary incisor was (Stms-incisor') is an essential factor in determining the vertical position of the maxilla. Two millimeters of the maxillary incisor showing below the upper lip with the lip at rest have been shown to be desirable. This will also correspond in general with a pleasing smile. Interlabial gap, or the vertical distance between the upper and lower lip with the lips in repose, has been shown by Burstone,<sup>6</sup> to be fairly at a range from approximately 3 mm apart to just lightly touching.

In planning surgery on patients with vertical discrepancies, lip length is an important factor. Lips may be relatively short, allowing the patient to produce lip closure only with great difficulty. If the upper lip length is short, an excessive amount of the maxillary incisors will show during speaking and smiling. Therefore, diagnosis of vertical discrepancies depends on soft tissues as well as hard tissue factors. Skeletal analyses tend to use arbitrary plane such as Frankfort horizontal and sella-nasion to determine if a maxilla or mandible is abnormally positioned. Reference planes can be misleading as they can vary just as the landmarks in the maxilla and mandible that are related to them. Although a postural horizontal plane can correct arbitrary nature of a reference plane, it does not solve the basic problems that a good facial profile reflects harmony between any facial areas that are dependent on tooth position, bone position, and soft tissue mass. Thus, soft tissue areas such as the neck, nose and lips must be considered in determining whether prognathism or retrognathism of the jaw exists. To eliminate inter-examiner variability, we traced all the radiographs

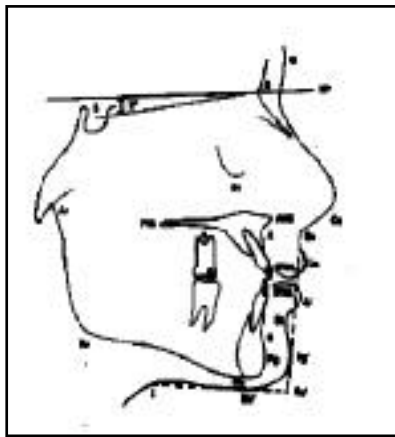


Figure 1

Figure 1 - Cephalometric landmarks. G - glabella, Sn - subnasale, HP - horizontal reference plane, Me' - Soft tissue menton, Gn' - soft tissue gnathion, C - Cervical point, Cm - columella point, S - sella, Ls - labrale superius, Pg' - soft tissue pogonion, Li - labrale inferius, Si - mentolabial sulcus, Stms - stomion superius, Stmi - stomion inferius, N - nasion, Or - orbitale, Go - gonion

Table 1 - Normal adult Saudi male and female variables (N=20).

Table 2 - Means, SD, and ranges for soft tissue variables in 40 Saudi adults with esthetically pleasing faces.

Table 1

Gender	Sn-Gn'/C-Gn'	Cm-Sn-Ls	Ls-(Sn-Pg')	Li-(Sn-Pg')	Si-(Li-Pg')	Sn-Stms/Stmi-Me' (HP)
<b>Male N</b>	20	20	20	20	20	20
Minimum	1.0	90	3	1	3	0.4
Maximum	2.0	110	8	8	9	0.6
Range	1.0	20	5	7	6	0.2
Mean	1.285	98.80	5.20	4.85	6.10	0.448
SD	.208	6.56	1.58	1.87	1.71	5.955E-02
<b>Female N</b>	40	40	40	40	40	40
Minimum	1.0	90	1	-1	3	0.3
Maximum	2.0	120	8	8	9	0.6
Range	1.0	30	7	9	6	0.3
Mean	1.233	101.35	4.57	4.01	5.63	0.46
SD	0.175	7.41	1.66	2.07	1.58	6.736E-02

Sn - subnasale, Gn' - soft tissue gnathion, C - cervical point, Cm - columella point, Ls - labrale superius, Pg' - soft tissue pogonion, Li - labrale inferius, Si - mentolabial sulcus, Stms -stomion superius, Stmi - stomion inferius, HP - horizontal reference plane

Table 2

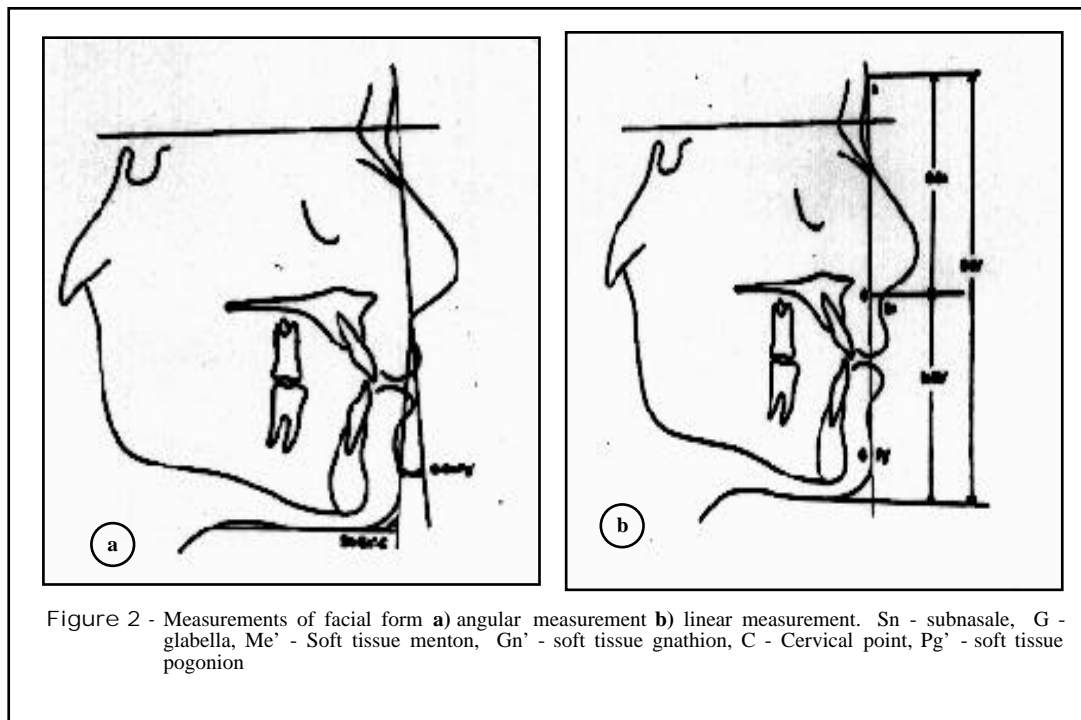
Measurement	Landmarks	Male		Female	
		Mean	SD	Mean	SD
Surgical relation	A-N-B	3.725	1.482	3.750	1.552
<b>Facial form</b>					
Facial convexity angle	G-Sn-Pg'	15	4.82	13.10	4.23
Maxillary prognathism	G-Sn (HP)*	7.925	3.533	7.150	2.796
Mandibular prognathism	G-Pg' (HP)*	0.35	6.56	0.80	4.81
Vertical height ratio	G-Sn/Sn Me' (HP)†	0.990	7.881E-02	1.090	0.125
Lower face-throat angle	Sn-Gn'-C	109.90	6.62	102.90	5.67
Lower vertical height-depth ratio	Sn-Gn'/C-Gn'	1.285	0.208	1.180	0.115
<b>Lip position and form</b>					
Nasolabial angle	Cm-Sn-Ls	98.80	6.56	103.90	7.49
Upper lip protrusion	Ls to (Sn-Pg')	5.20	1.58	3.95	1.54
Lower lip protrusion	Li to (Sn-Pg')	4.85	1.87	3.18	1.96
Mentolabial sulcus	Si to (Li-Pg')	6.10	1.71	5.15	1.31
Vertical lip-chin ratio	Sn-Stms/Stmi-Me' (HP)	0.48	5.955E-02	0.445	7.592E-02
Maxillary incisor exposure	Stms-incisal	3.58	1.21	2.85	1.60
Interlabial gap	Stms-Stmi (HP)	2.95	1.39	1.98	0.47

\* (HP) refers to parallel to horizontal plane, † (HP) refers to perpendicular to horizontal plane, A - point A, N - nasion, B - point B, G - glabella, Sn - subnasale, HP - horizontal reference plane, Me' - soft tissue menton, Gn' - soft tissue gnathion, C - cervical point, Cm - columella point, S - sella, Ls - labrale superius, Pg' - soft tissue pogonion, Li - labrale inferius, Si - mentolabial sulcus, Stms -stomion superius, Stmi - stomion inferius

Table 3 - Saudi normal cephalometric values compared with Legan and Burstone analysis.

Measurement	Landmarks	Saudi adult norms		Caucasian norms	
		Mean	SD	Mean	SD
<b>Facial form</b>					
Facial convexity angle	G-Sn-Pg'	14.05	4.58	12	4
Maxillary prognathism	G-Sn (HP)*	7.538	3.169	6	3
Mandibular prognathism	G-Pg' (HP)*	0.57	5.68	0	4
Vertical height ratio	G-Sn/Sn Me' (HP)**	1.040	0.115	1	-
Lower face-throat angle	Sn-Gn'-C	106.40	7.04	100	7
Lower vertical height-depth ratio	Sn-Gn'/C-Gn'	1.233	0.175	1.2	-
<b>Lip position and form</b>					
Nasolabial angle	Cm-Sn-Ls	101.35	7.41	102	8
Upper lip protrusion	Ls to (Sn-Pg')	4.57	1.66	3	1
Lower lip protrusion	Li to (Sn-Pg')	4.01	2.07	2	1
Mentolabial sulcus	Si to (Li-Pg')	5.63	1.58	4	2
Vertical lip-chin ratio	Sn-Stms/Stmi-me' (HP)	0.446	6.736E-02	0.5	-
Maxillary incisor exposure	Stms-incisal	3.21	1.45	2	2
Interlabial gap	Stms-Stmi (HP)	2.46	1.14	2	2

\* (HP) refers to parallel to horizontal plane, † (HP) refers to perpendicular to horizontal plane, G - glabella, Sn - subnasale, HP - horizontal reference plane, Me' - soft tissue menton, Gn' - soft tissue gnathion, C - cervical point, Cm - columella point, S - sella, Ls - labrale superius, Pg' - soft tissue pogonion, Li - labrale inferius, Si - mentolabial sulcus, Stms - stomion superius, Stmi - stomion inferius



after having been examined many times by another colleague who selected randomly a radiograph and trace it again after 3 days and compare it with the first one. We reduced the linear measurement errors to 0.3-0.8 mm and the angular measurement errors to 0.5-3 degrees.

**The soft tissue analysis.** Facial form to describe the overall horizontal soft tissue profile contour angle, G-Sn-Pg', is evaluated (Figure 2a). This angle is formed by the line G to Sn and the line Sn to Pg'. The mean and standard deviation for this angular measurement, as well as the other measurements that are described, are found in Table 1. A line perpendicular to the HP is dropped from G and the relationship of the maxilla and mandible are related to it to determine if the problem is maxillary or mandibular (Figure 2b). The distance to Sn, for this vertical line measured parallel to the HP describes the amount of maxillary excess or deficiency in the anteroposterior dimension. The position of pogonion is also measured parallel to HP from the perpendicular line dropped from G. This measurement gives an indication of mandibular prognathism, as the magnitude of mandibular deficiency becomes more negative and the measurement G-Pg' (HP) becomes smaller. The lower face-throat angle (Sn-Gn'-C) is formed by the intersection of the lines Sn-Gn' and Gn'-C. An appreciation of this angle is critical in planning treatment to correct anteroposterior facial dysplasias. The ratio of the distance Sn to gnathion (Sn-Gn'/C-Gn') is normally a little larger than one, in other words, if this ratio becomes much larger than one, the patient has a relatively short neck, and the anterior projection of the chin probably should not be reduced. In the vertical dimension, the anterior facial proportionality is assessed by taking the ratio for middle-third facial height to lower third facial height measured perpendicular to HP. The ratio of the distances G-Sn and Sn-Me' should be approximately one to one and would connote a disproportionately large lower third of the face and therefore vertical maxillary excess, vertical macrogenia, or a combination of these deformities. Further evaluation of the lower third of the face is then necessary to make this distinction. Lip position is the nasolabial angle (Cm-Sn-Ls) which is important measurement in assessing anteroposterior maxillary dysplasias.

Although the nasolabial angle takes into account the inclination of the columella of the nose, it is useful in evaluating the position of the upper lip. An acute nasolabial angle will often allow us to surgically retract the maxilla or retract the maxillary incisors, or both. An obtuse nasolabial angle suggests a degree of maxillary hypoplasia and calls for a maxillary advancement or orthodontic proclination of maxillary incisors.

Anteroposterior lip position is evaluated by drawing a line from Sn to Pg', and the amount of lip protrusion or retrusion is measured as a perpendicular linear distance from this line to the most prominent point of both lips. There are many factors involved in lip protrusion, which can be controlled by various orthodontic and surgical procedures. Retracting or protracting the incisors

surgically or orthodontically, advancing or reducing the prominence of the chin, or both, can achieve concordant lip position.

**Discussion.** This study compared soft tissue measurements of a sample of adult Saudi population with esthetically pleasing face to a Caucasian sample of Legan and Burstone.<sup>3</sup> The soft tissue analysis of these authors are among the most detailed studies available. Our selection of sample size and age range matches that of the Caucasian population. The results of the present study using Legan and Burstone<sup>3</sup> analysis are significant. They showed that the normal Saudis have a slightly lesser obtuse nasolabial angle, and more anteriorly positioned upper and lower lips. As of present and up to our knowledge, no such published study has been carried out on Saudi population. The aim of this study was to determine the differences in soft tissue parameters between samples of male and female Saudi population with esthetically pleasing profiles, and compare the findings with that of Legan and Burstone<sup>3</sup> for a white population. Normal occlusion, which is not necessarily related to beauty<sup>7</sup> was one of the criteria used in the selection of the normal group. It is therefore questionable whether these parameters are of paramount determinants of a beautiful face.<sup>8-9</sup> Previous investigations<sup>10-13</sup> showed that soft tissue measurements displayed some error on the reliability of integumental landmark location. Still, the results of this study have clinical implications in the diagnosis and treatment of adult Saudis with dentofacial deformities. However, care should be taken when we try to apply these esthetic norms, and it should be kept in mind that each treatment should be preceded by an open and uninhibited discussion with the patient, and that orthodontic treatment, orthognathic or plastic surgery should be planned according to individual needs.

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## References

1. Bergman RT. Cephalometric soft tissue facial analyses. *Am J Orthod Dentofacial Orthop* 1999; 116: 373-389.
2. Ricketts RM. Perspectives in the clinical application of cephalometrics. *Angle Orthod* 1981; 51: 115-150.
3. Legan HL, Burstone CJ. Soft tissue cephalometric analysis for orthognathic surgery. *J Oral Surg* 1980; 38: 744-751.
4. Epker BN, Stella JP, Fish LC. Dentofacial deformities: Integrated Orthodontic and Surgical correction. St. Louis: CV Mosby; 1998. p. 29-33.
5. Holdaway RA. A soft tissue cephalometric analysis and its use in orthodontic treatment planning: Part I. *Am J Orthod* 1983; 84: 1-28.
6. Burstone C. The integumental profile. *Am J Orthod* 1958; 4: 1-25.
7. Ricketts RM. Planning treatment on the basis of the facial pattern and on estimate of its growth. *Angle Orthod* 1957; 27: 14-37.

8. Pogrel MA. What are normal esthetic values? *J Oral Maxillofac Surg* 1991; 49: 963-969.
9. Alcalde RE, Jinno T, Orsini MG, Sasaki A, Sugiyama RM, Matsumures T. Soft tissue cephalometric norms in Japanese adults. *Am J Orthod Dentofacial Orthop* 2000; 118: 84-89.
10. Wisth PJ. Changes of the soft tissue profile during growth. *Trans Eur Orthod Soc* 1972; 123-131.
11. Wisth PJ, Boe OE. The reliability of cephalometric soft tissue measurements. *Archs Oral Biol* 1975; 20: 595-599.
12. Hilesund E, Fjeld D, Zachrisson BU. Reliability of soft tissue profile in cephalometrics. *Am J Orthod* 1978; 74: 537-550.
13. Zylinski CG, Nanda RS, Kapila S. Analysis of soft tissue facial profile in white males. *Am J Orthod Dentofacial Orthop* 1992; 101: 514-518.

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**Authors:** Akpate O, Ojo MA, Eroje BM, Ohre O  
**Institute:** University of Benin, Benin, Nigeria  
**Title:** Congenital cleft lip, cleft palate and lip fistulae (Van Derwoude syndrome) in two Nigerian families  
**Source:** Saudi Med J 1995; 16: 40-43.

**Abstract**

Two nigerian families with congenital lower lip pits in association with unilateral or bilateral cleft lip and palate and inguinal hernia are described. Van Derwoude syndrome was not reported among the nigerian populace in the literature. The fact that these cases presented in the hospital clinic shows a change in the attitude of the populace towards birth defects, it can be reasonably concluded that an era of infanticide is closed or drawing to an end. Treatment modalities for lip pits are surgical repair or leaving it alone as in one of our cases. Clefts of the lip and palate are surgically repaired to achieve the objectives of proper speech, function and aesthetics.