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SAUDIAN NORMS OF MC NAMARA'S CEPHALOMETRIC ANALYSIS

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ABSTRACT :

Cephalometric normals of Mc Namara's analysis were studied in a sample of 60 adult Saudian subjects (30 males and 30 females), who satisfied the criteria of pleasing face. The age was ranged from 20 to 25 years. Cephalometric radiographs were taken and traced for all subjects. Students t-test was used for data analysis. Eleven skeletal and dental cephalometric variables were studied. The results showed that, there were statistically significant gender differences in four variables. Mandibular length, midface length, lower anterior facial height and mandibular plane angle were higher in males than females. There were a significant racial differences in nine variables. Where Saudian sample had more retrusive maxilla and mandible, more vertical mandibular growth pattern, and more dental protrusion.

INTRODUCTION

Since the introduction of radiographic cephalometrics in 1930 by Broadbent[1] in United States and Hofrath[2] in Germany, it has become one of the most important tools for the study of maloclusion and underlying skeletal disproportion . There was a list of well known and popular cephalometric analyses included no fewer than 23 analyses introduced between 1946 and 1985[3].

There are two basic ways have been developed for these analyses. One is the approach chosen originally by Downs and followed by most workers [4-10]. This is the use of selected linear and angular measurements. The other is to express the normative data graphically and compare the patient's dentofacial form directly to the graphic reference (template)[11]. One of the most recent

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additions is the Mc Namara's[12] analysis. The analysis method is derived, in part, from the principles of the cephalometric analysis of Rickets and Harvold[13]. Although other aspects, such as the construction of the nasion perpendicular to the Frankfort horizontal described by Burrstone et al[14]

This method of analysis represented an effort to relate teeth to teeth, teeth to jaws, each jaw to the other, and the jaws to the cranial base.

This approach makes the actual analysis most suitable for diagnosis, treatment planning, and treatment evaluation, not only of convention orthodontic patients , but also for patients with skeletal discrepancies who, are candidates for dentofacial orthopedics and orthognathic surgery[12] .

Variations in dentofacial structure of different ethnic groups has been noticed by some investigators[15,16,17,18,19,20]. For appropriate application of any cephalometric analysis, it must be used with normals derived from populations similar to orthodontic patients with regard to ethnic group, sex and age[18] .

Aim of the study:

The purpose of this study was to:

1) Develop cephalometric standards for Saudian males and females adults using Mc Namara's angular and linear measurements .
2) Compare the collected data with the normals of Mc Namara.

Materials and Methods :

The materials for the present study consisted of sixty Saudian subjects (30 males and 30 females). The age ranged from 20 to 25 years . They were selected from Al-Jazeera Clinic – Riyadh – Saudi Arabia.

- All subjects were living in Riyadh
- All subjects met the following criteria :

1) Normal skeletal (Class I) and dental (Class I molar) relationship .
2) They had no vertical, transverse or anteroposterior discrepancies .
3) They had balanced facial profile .
4) No history of orthodontic treatment .

Lateral cephalograms were taken with the teeth in centric occlusion and the head oriented to the Frankfort horizontal plane.

The cephalometric radiographs were traced by hand on sheets of 0.003 matte acetate papers with 0.5 mm lead pencil by the same person. The following landmarks were identified on each x – ray film fig (1)

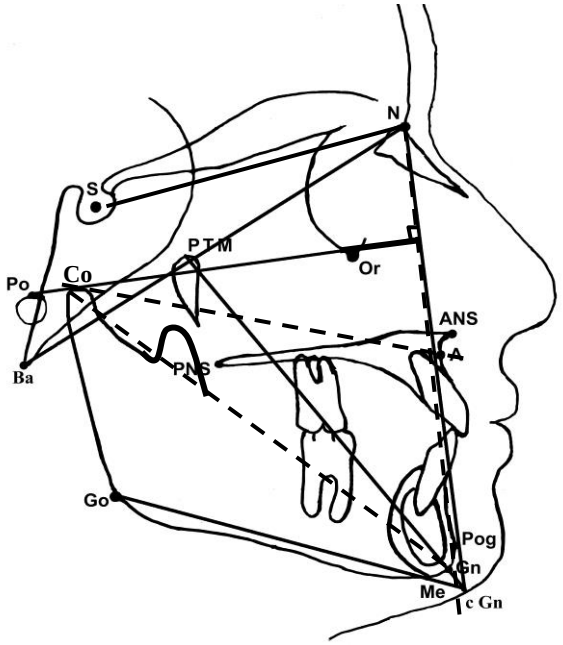

Figure 1. The cephalometric landmarks and definitions (McNamara)[12]. S indicates sella (the center of sella turcica); N, nasion (the most anterior limit of suture nasofrontalis); Ba, basion (the posterior inferior point on the occipital bone at the anterior margin of the foramen magnum); ANS, anterior nasion spine (the apex of the anterior nasal spine); A, subspinale (the most posterior point on the concave anterior border of the maxillary alveolar process); Po, pogonion (the most anterior point on the mandibular symphysis); Gn, anatomical gnathion (the most anteroinferior point of the mandibular symphysis); cGn, constructed gnathion (the intersection of the facial plane and the mandibular plane); Me, menton (the lowermost point on the shadow of the mandibular symphysis); Go, gonion (the most outward point on the angle formed by the junction of the ramus and body of the mandible on its posterior, inferior aspect); Co, condylion (the most posterior point on the outline of the mandibular condyle); P, porion (the superior aspect of the external auditory meatus); Or, orbitale (the lower border of the orbit of the eye); PTM, pterygomaxillary fissure (the most posterosuperior aspect of the pterygomaxillary fissure) .

Linear and angular measurements Fig (1)

Maxilla to cranial base

1) **point A to nasion perpendicular (A to Na-p) :** A vertical line is constructed from nasion and perpendicular to FHP. The perpendicular distance is measured from point A to the nasion perpendicular.

2) **SNA:** The angle between the SN and NA lines.

Mandible to Maxilla

3) **Effective mandibular length (Co-Gn):** Condylion to the anatomic gnathion.

4) **Effective midface length (Co-A):** Condylion to point A.

5) **Maxillomandibular differences (MxMD-DF):** Effective mandibuar length minus effective midface length.

6) **Lower anterior face height (ANS-Me):** ANS to menton

7) **Mandibular plane angle (MD-P):** The angle between the anatomic Frankfort plane and the mandibular plane, (gonion-menton) .

8) **Facial axis angle (FA-A):** The angle between the BaN and the facial axis (PTM to the constructed gnathion).

Mandible to cranial base

9) **Pogonion to nasion perpendicular (Pg-N):** The perpendicular distance from the pogonion to the nasion perpendicular.

Dentition

10) **Upper incisor to point A (Ui-A):** The perpendicular distance from the most anterior surface of the upper incisor to the point A perpendicular (A perpendicular is constructed parallel to the nasion perpendicular through point A) .

11) **Lower incisor to A-Po line (Li-APg) :** The distance form the facial surface of the lower incisor to the A-pogonion line.

Statistics :

Mean and standard Deviation (SD) were calculated for each variable of both males and females .

Students t-test was performed to detect any statistical significant changes between Saudian males and females and between Saudian sample and Mc Namara's sample.

RESULTS

The cephalometric normals of Mc Namara's analysis for males and females Saudian subjects and the results of the t – test are presented in table 1.

It revealed that, there were no significant gender differences for the variables relating the maxilla to cranial base, mandible to cranial base and dentition. Four variables are significantly larger in males than females: Mandibular length,

(128.35 ± 2.76 in males, 119.68 ± 3.0 P ≤ 0.01 significant) mid face length, (99.78 ± 1.57 in males, and 93.81 ± 2.6 in females P ≤ 0.01) lower anterior facial height (72.28 ± 3.33 in males, and 68 ± 2.98 in females ≤ 0.01) and mandibular plane angle (31.5 ± 4.36 in males, and 27.75 ± 2.93 in females P ≤ .

The ethnic differences for males and females and the results of t tests were given in tables 2 and 3 respectively.

Among both males and females subjects, no significant differences were noted between Saudian sample and Mc namara's sample in the mandibular length, midface length and the maxillomandibular differences. However, there were statistically significant differences in eight variables. Four variable were larger in Mc Namara. These included, A point to nasion perpendicular, SNA angle, pogonion to nasion perpendicular, and facial axis angle. On the other hand, four variables were greater in Saudian sample, as lower anterior facial height, mandibular plane angle, upper incisor to A – perpendicular, and lower incisor to A Pog .

Table (1): Cephalometric normales of Mc Namara's analysis in Saudian.

Variables	Males		Females		Significance	
	Mean	S D	Mean	S D	T - test	P
Maxilla to cranial base						
1) A point to Nasion perpendicular (mm)	- 0.21	± 1.88	- 0.56	± 1.54	0.555	0.583
2) SNA( )°	82.35	± 1.64	81.25	± 2.04	1.615	0.117
Mandible to Maxilla						
3) Mandibular length (mm)	128.35	± 2.76	119.68	± 3.21	5.497	000 *
4) Midface length (mm)	99.78	± 1.57	93.81	± 2.68	8.497	000 *
5) Maxillo mandibular differences (mm)	28.67	± 2.92	26.00	± 1.26	- 1.688	0.103
6) Lower anterior face height (mm)	72.28	± 3.33	68	± 2.98	3.711	0.001 *
7) Mandibular plane angle ( )°	31.5	± 4.36	27.75	± 2.93	2.79	0.009 *
8) Facial axis angle ( )°	88.21	± 2.54	88.36	± 1.71	- 1.72	0.096
Mandible to cranial base						
9) Pogonion to nasion perpendicular (mm)	- 5.35	± 2.59	- 6.31	± 4.04	0.757	0.455
Dentition						
10) Ui-A (mm)	7.23	± 1.16	7.35	± 1.12	- 0.598	0.554
11) Li-APg (mm)	4.92	± 1.85	4.12	± 1.62	- 0.309	0.760

* P ≤ 0.05 significant

Table (2): Comparison between Saudian and Mc Namara's males:

Variables	Saudian		Mc Namara		Significance	
	Mean	S D	Mean	S D	T - test	P
Maxilla to cranial base						
1) A point to Nasion perpendicular (mm)	- 0.21	± 1.88	1	± 2.7	- 2.406	0.032*
2) SNA( )°	82.35	± 1.64	83.9	± 3.2	- 3.508	0.004*
Mandible to Maxilla						
3) Mandibular length (mm)	128.85	± 2.62	131.2	± 5.3	- 1.112	0.090
4) Midface length (mm)	99.78	± 1.57	100	± 6	- 1.863	0.085
5) Maxillo mandibular differences(mm)	28.67	± 2.92	31.2	± 4	- 2.610	0.072
6) Lower anterior face height(mm)	72.28	± 3.33	66.7	± 4.1	- 2.594	0.022*
7) Mandibular plane angle( )°	31.5	± 4.36	21.3	± 3.9	8.747	000*
8) Facial axis angle( )°	88.21	± 2.54	90	± 3.5	- 2.62	0.021*
Mandible to cranial base						
9) Pogonion to nasion perpendicular(mm)	- 5.35	± 2.59	- 0.3	± 3.8	- 7.695	000*
Dentition						
10) Ui-A	7.23	± 1.16	5.3	± 2	5.805	000*
11) Li-APg	4.92	± 1.85	2.3	± 2.1	3.265	0.020*

* $P \leq 0.05$ significant

Table (3): Comparison between Saudian and Mc Namara's Females :

Variables	Saudian		Mc Namara		Significance	
	Mean	S D	Mean	S D	T - test	P
Maxilla to cranial base						
1) A point to Nasion perpendicular (mm)	- 0.56	± 1.54	1	± 2.3	- 4.038	0.001*
2) SNA ( )°	81.25	± 2.04	82.4	± 3	- 2.245	0.040*
Mandible to Maxilla						
4) Midface length (mm)	93.81	± 2.68	94	± 4.3	- 0.279	0.784
5) Maxillo mandibular differences(mm)	26	± 1.26	27.2	± 3.3	- 10.119	0.092
6) Lower anterior face height (mm)	68	± 2.98	66.7	± 4.1	1.740	0.012*
7) Mandibular plane angle ( )°	27.75	± 2.93	22.7	± 4.3	6.888	000*
8) Facial axis angle ( )°	88.36	± 1.71	90	± 3.2	- 1.023	0.323
Mandible to cranial base						
9) Pogonion to nasion perpendicular (mm)	- 6.31	± 4.04	- 1.8	± 1	- 4.462	000*
Dentition						
10) Ui-A (mm)	7.35	± 1.12	5.4	± 1.7	- 0.280	0.030*
11) Li-APg (mm)	4.12	± 1.62	2.7	± 1.7	1.044	0.021*

* $P \leq 0.05$ significant

DISCUSSION

Our study established normal for Mc Namra's analysis in Saudian sample separate for gender . The study was based on (30 males and 30 females) aged 20 – 25 years with well balanced faces and good occlusion .

In regarding the gender differences, there were significant differences between males and females in four variables. The mandibular length, midface length, lower anterior facial height, and mandibular plane angle were significantly higher in males than females ($P < 0.05$). This result was in agreement with other cephalometric studies which recorded gender differences [3.12.18.19] in mandibular and maxillary length and lower anterior facial height . This finding was contrary to the findings of other studies which reported no significant differences between males and females for any cephalometric measurements in chinese[21] and Jordanian[22] samples.

However, for the maxilla to cranial base, the mandible to cranial base and dentition variables . There were no statistically significant difference between males and females .

When Saudian sample was compared with Mc Namara's sample there was no significant difference in midface length, mandibular length, and maxillomandibular difference .

On the other hand, there was racial difference in eight variables. The maxilla and mandible were more retruded in relation to the cranial base. This may be a true retrusion or due to forward position of the nasion point giving the appearance that the maxilla and mandible are posteriorly positioned relative to the nasion perpendicular. Also point A is a dentoalveolar point may be positioned posteriorly if there is labial tipping of the incisors by lingual tipping of the roots. Backward and downward rotation of the mandible by increased lower face height and madibular plane angle will position pogonion point more posteriorly. This result was agreed with other studies which revealed skeletal retrusion for Iranian,[23] Chinese,[3] and Japanese . This finding disagreed with Saudian[18] and Kuwaitis[19] studies which recorded more convex profile with increased ANB angle due to reduced protrusion of the chin. Lower anterior facial height and mandibular plane angle were significantly higher in Saudian. Also there were more dental protrusion. This findings were similar to the findings of the studies made on Chinese[3] Saudian,[18] Kuwaitis[19] Japanes[20] and Iranian[23] samples. However, this is in contrast to a cephalometric study made on Jordanian[22] and recorded no significant difference between Jordanian and British .

Our findings indicates that, separate standards should be used for each gender, and ethnic population. Although the mean values are useful diagnostic aids they should not be used as treatment goals for individual patients. The objective of treatment must be to obtain tooth relationships in harmony with the facial and dental morphology.

CONCLUSION

It would preferable to use specific normals, separate for gender, because a comparison has revealed statistically significant differences in most variables between males and females and between Saudian and Mc Namra's measurements .

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