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RESEARCH ARTICLE

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ABSTRACT

Objective: The aim of this study was to develop the cephalometric standards for skeletal and dental relationships among a sample of Yemeni population.

Material and Methods:
One hundred ninety four Yemeni adults (105 females and 89 males) aged 18–25 years, were selected from dental collages in Sana'a. All participants had Class I occlusion with normal growth, facial symmetry, and no previous orthodontic, orthopedic or maxillofacial surgery treatment. A Lateral cephalometric X-ray film was done for all of them. Each film was traced and analyzed using Harvold's cephalometric Analysis.

Results:
Statistical significant differences were found in the sagittal relationship in SNB, ANB, SNPg and SNBa angles when comparing male with female. No significant difference was seen in SNA angle.
In the vertical inclination, statistical significant differences in ML-NL, NL-NSL, ML-NSL and Gn-tgo-Ar variables were found.
Yemeni males had statistically significant higher upper and lower facial height then female.
No significant difference between genders in the dental relationship variable except the relation between 1-NB line which is statistically higher in female.

Conclusion:
The results of Yemeni cephalometric features showed ethnic differences in skeletal and dentoalveolar relationship and awareness of the dentofacial pattern of each population will ensure better results of treatment in establishing optimal facial harmony.

INTRODUCTION

Cephalometric norms had been used to determine the location and the severity of any existing dentofacial discrepancies and subsequently to evaluate the changes that accompany orthodontic treatment. If the normal pattern and its range of variation could be described, then the abnormal one could be judged by comparison.[1,2]

Normal cephalometric features had been established among different races and populations worldwide. It is important to compare a patient's cephalometric findings with the norms for his or her ethnic, while considering his or her treatment goals and needs to provide a better and accurate diagnostic evaluation and treatment. Differences in the dentofacial relationships of various ethnic groups have been observed by many investigators, and as a result, number of standards have been developed for various racial and ethnic groups.[3-10] Most of Arabic countries had studied there norms.[6-13] To our

knowledge no data available about Yemeni population concerning cephalometric features of skeletal and dental variables. Therefore the present study was carried out to establish the skeletal and dental cephalometric standard features of Yemeni adults which are essential in orthodontic diagnosis and treatment plane.

MATERIALS AND METHODS

This study was conducted in Sana'a at the faculties of dentistry. A letter of ethical clearance to carry this study was obtained from the dean faculty of dentistry of Sana'a University to the deans of Al-Salam and Science and Technology, and a letter of consent was obtained from all participants after explaining the nature and purpose of taking the radiograph. The aims of the study were explained to all dental students (18 to 25 years old). Intra-oral examination was performed for all students (1585) in the dental clinics at each. Students who fulfill the inclusion criteria of normal occlusion with balanced facial profile, full

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permanent dentition (except for the third molars), Class I molar, incisor and canine relationship, normal overjet and overbite, normal transversal occlusion, well aligned or crowded teeth not more than 2 mm and no previous history of orthodontic treatment were registered. Later on, the selected students who fulfilled the criteria were called according a schedule made with the X-ray center. On the day of X-ray taking, each participant had signed the consent form and worn the Lead apron for taking the X-ray. The radiographic unit was Pax-flex3D.

Each cephalometric film was placed with the profile to the right on X-ray illuminator box. The tracings were performed in a darkened room. All radiographs were traced by hand, and whole angular and linear measurements made by a single author (Figure 1).

The following cephalometric points were used in this study

1. **N- Nasion**: The anterior point of the intersection between the nasal and frontal bones.
2. **S- Sella**: The midpoint of the sella turcica cavity.
3. **Ba- Basion:** The lowest point on the anterior margin of the foramen magnum, at the base of the clivus.
4. **Sp-anterior nasal spine:** The tip of the anterior nasal spine
5. **Point A:** The innermost point on the contour of the premaxilla between the anterior nasal spine and the incisor tooth (referred to as subspinale or subnasale).
6. **Pm-Pterygomaxillare:** The intersection of the posterior contour of the maxilla with the contour of the soft and hard palate
7. **is-incision superius:** The midpoint of the incisive edge of the mean maxillary central incisor.
8. **isa-apical point of the maxillary incisor:** The most apical point of the mean maxillary central incisor.
9. *Point B:* The innermost point on the contour of the mandible between the incisor tooth and the bony chin (referred to as supramentale).
10. **Pg-Pogonion:** The most anterior point on the contour of the chin.
11. **Gn-Gnathion:** The center of the inferior point on the mandibular symphysis.
12. **ii-incision inferius:** The midpoint of the incisive edge of the mean mandibular central incisor.
13. **iia-apical point of the mandibular incisor:** This is the most apical point of the mean mandibular central incisor.
14. **Ar-Articulare:** The point of intersection between the shadow of the zygomatic arch and the posterior border of the mandibular ramus.
15. **tgo-Gonion-tangent point:** The point of intersection between mandibular line and the ramus line.
16. **Sp' Spina prime:** The intersection of the nasal line and the nasiongnathion line.

The following cephalometric lines were used in the study (figure 2)

1. **NSL Nasion-sella line:** It represents the cranial base. It is the main reference line which connects the point sella to the point nasion.
2. **NL Nasal line:** This is the connection between the pterygomaxillare (Pm) and the anterior nasal spine (Sp). It is used as the reference line of the nasal cavity and the maxillary base.
3. **ML Mandibular line:** The tangent from gnathion (Gn) to the inferior border of the angle of the mandible. It is used as a reference line for the body of the mandible.
4. **NAL Nasion-maxillary line:** It is the line between nasion (N) and point A (A) and used as the reference line for the position of the maxillary incisor.
5. **NBL Nasion-mandibular line:** It is the line between nasion (N) and point B (B) and used as the reference line for the position of the mandibular incisors. It is also used for measuring the chin prominence.
6. **NPg Nasion-pogonion line:** It is the line between nasion (N) and pogonion (Pg) and used to describe the sagittal position of the chin and a reference line for the position of the lower incisors.
7. **Ramus line:** It is the line connecting the point articulare (Ar) and the gonion-tangent point (tgo).
8. *Clivus line:* It is the line connecting points sella (S) and basion (Ba) and representing the posterior cranial base (saddle angle).
9. **Nasion-gnathion line:** It serves as the reference line for evaluating the index of the anterior facial height and connects point nasion (N) and point gnathion (Gn).
10. **B-Pog line:** It is the tangent of the chin prominence, connecting points B (B) and pogonion (Pg) and aids in the evaluation of the Norderval angle (B-pog-ML).
11. **1:** The line passing through the incisal point (is) and the apical point (isa) of the mean maxillary central incisor representing the long axis of the maxillary central incisor.
12. **Ī:** The line passing through the incisal point (ii) and the apical point (iia) of the mean mandibular central incisor representing the long axis of the mandibular central incisor.

The Skeletal and dental cephalometric measurements

Twenty linear and angular measurements were obtained from the cephalometric tracings to evaluate the Skeletal and dental pattern. These include the followings:

Antero-posterior

1. **SNA°:** This angle evaluates the anterior-posterior position of the maxilla to the anterior cranial base.
2. **SNB°:** This angle evaluates the anterior-posterior position of the mandible to the anterior cranial base.
3. **ANB°:** It is the difference between the SNA° and SNB°. It indicates the discrepancy between the maxilla and mandible.
4. **SNPg°:** It evaluates the anterior-posterior position of the chin to the anterior cranial base.
5. **NSBa°:** It expresses the cranial base angle.

The vertical inclination

1. **ML-NL°:** It expresses the degree of vertical inclination of the mandible in relation to the maxilla.

2. **NL-NSL°:** It expresses the degree of vertical inclination of the maxilla in relation to the anterior base of the skull.
3. **ML-NSL°:** It expresses the vertical inclination of the mandible in relation to the anterior base of the skull.
4. **Gn-tgo-Ar°:** Is expresses the vertical form of mandible in relation to the body and the ramus.

Face height

1. *N-Sp' mm :* It represents the upper facial height (UFH)
2. *Sp'-Gn mm:* It represents the lower facial height (LFH).
3. *N – Sp' / Sp' – Gn x 100%:* The facial index expresses the relationship between the upper and lower facial heights of the total anterior facial height.

The Chin prominence

1. *Pg-NB mm:* It describes the size of the bony chin prominence.
2. *Nordeval (N angle):* It expresses the prominence of the bony chin in relation to the mandibular plane, ML. It measures the inclination of the symphysis which is an indicator of mandibular rotation.

The dental variables

1. *1 - Ī angle (interincisal angle):* Describes the position of the upper and lower incisors.
2. *1-NA°:* The angular relationship of the upper central incisor to the NA line indicates the anterior-posterior relationship of the upper incisor to the maxillary base.
3. *Ī-NB°:* The angular relationship of the lower central incisor to the NB line indicating the anterior-posterior relationship of the lower incisor to the mandibular base.
4. *1-NA mm:* It indicates the linear anterior-posterior relationship of the upper central incisor edge to the NA line.

5. *Ī-NB mm:* It indicates the linear anterior-posterior relationship of the lower central incisor edge to the NB line.

Statistical analysis

Statistical method

The data obtained, including the mean, standard deviation, minimum and maximum values, were statistically described using SPSS program version 19. Differences in measurements between male and female were tested using independent student t-test. A significance value of p<0.05 was considered statistically significant.

Statistical analysis error of the method

To determine the errors associated with radiographic measurements, 45 radiographs were selected randomly. Their tracings and measurements were repeated one month after the first measurements.

In general, the error of the measurements was small. Systematic error was estimated by using a paired *t* test; the differences between the first and second measurements were statistically insignificant.

This study of cephalometric values of Yemeni adults was compared to published data of Arabs and some other populations

RESULTS

Table I showed the mean, maximum, minimum, standard deviation and P-value of cephalometric features of both male and female Yemeni adults.

Table I Skeletal and dental cephalometric measurements of Male and Female Yemeni adults

Variables	Male 89				Female 105				P- value
	Mean	Max.	Min.	S.D.	Mean	Max.	Min.	S.D.	
Skeletal									
Anteroposterior									
SNA°	80.9	86.5	72	2.5	80.819	86	75	2.58	.818
SNB°	78.3	85.5	70.5	2.5	77.53	82	72	2.45	.034*
ANB°	2.6	6	.5	1.17	3.28	7	1	1.4	.000*
SNPg°	79.2	85	72	2.6	78.25	83	72.5	2.53	.015*
SNBa°	130.7	151	117	5.9	132.6	146	119	6.1	.026*
Vertical inclination									
ML-NL°	20.1	35	9	5.6	22.4	32	9	5.2	.003*
NL-NSL°	8.9	21	2	3.7	10.7	22	3	3.6	.001*
ML-NSL°	29	41	20	5.8	33.1	43	21	4.5	.000*
Gn-tgo-Ar°	117	137	100	7.8	121.2	134	108	6.3	.000*
Face height									
N-Sp mm	63.58	75.9	51.5	5.7	57.1	70.7	48.1	5.5	.000*
Sp-Gn mm	77.9	99.6	63	8.3	69.4	86.1	55.6	7.3	.000*
N-Sp/Sp-Gn X100	81.92	92	68	6.55	82.62	103	69	7.12	.481
Chin Prominence									
Pg-NB mm	2.4	5.77	0	1.2	1.7	5.7	0	1.2	.000*
N angle°	63	77	55	4.9	61.7	74	53	5	.088
Dental Variable									
U1-L1°	127	143	110	7.3	125.8	139	108	7.04	.077
1NA°	21.3	34	10	5.5	21.8	30	12	4.4	.479
1NB°	26.5	39	15	4.15	29.2	43	19	4.6	.000*
1-NA mm	4.67	10.2	1.13	2	4.5	8.2	1.6	1.6	.596
1-NB mm	6	10.8	2.37	2	6.5	10.9	2.1	2.2	.128

* p < 0.05 is significant

Table II Descriptive statistics for the dentofacial patterns of Yemeni Adults.

Variable	Mean	Maximum	Minimum	SD
Skeletal				
AnteroPosrteior				
SNA°	80.86	86.5	72	2.54
SNB°	77.89	85.5	70.5	2.52
ANB°	2.97	7	.5	1.35
SNPg°	78.67	85	72	2.6
SNBa°	131.71	151	117	6.05
Vertical inclination				
ML-NL°	21.36	35	9	5.43
NL-NSL°	9.87	22	2	3.75
ML-NSL°	31.23	43	20	5.53
Gn-tgo-A°r	119.3	137	100	7.3
Face height				
N-Sp mm	60.03	75.9	48.1	6.48
Sp-Gn mm	73.29	99.6	55.65	8.82
N-Sp/Sp-GnX100	82	103	65	7
Chin Prominence				
Pg-NB mm	2.04	5.77	0	1.29
N angle °	62.3	77	53	4.98
Dental Variables				
U1-L1°	126.65	143	108	7.19
1NA°	21.57	34	10	4.96
1NB°	27.96	43	15	4.5
1-NA mm	4.6	10.2	1.13	1.78
1-NB mm	6.26	10.9	2.14	2.14

Figure 1 Cephalometric points used in the study.

Figure 2 Cephalometric lines and angles used in the study.

Table II showed descriptive statistics for the dentofacial patterns of Yemeni Adults in general.

In the sagittal relationship, statistical significant differences were found in SNB, ANB, SNPg and SNBa angles while SNA showed a non significant difference between male and female. SNB and SNPg were higher in male then female while ANB and SNBa were higher in female.

Moreover, the vertical inclination showed statistical significant differences in all variables used in the study (ML-NL, NL-NSL, ML-NSL and Gn-tgo-Ar) in which female had higher values then male.

Concerning the upper and lower facial height, it is noticed that, male had higher value then female. While the facial index showed a non significant difference.

The chin prominence showed a significant difference in Pg-NB line in which male had higher value then female, while Nordeval angle showed a non significant difference.

Dentally, there is no significant difference between the two genders except the angle formed by the lower incisor and NB line which is statistically higher in female the male.

DISCUSSION

This study focused on a sample of Yemeni adult population who had Class I skeletal and dental relationships and well balanced faces. The objectives of this study were to evaluate the cephalometric features of Yemeni population and to establish norms in which orthodontists could manage diagnosis and treatment of Yemeni patients according to their norms and not other ethnic norms. The data were separated according to sex to obtain more accurate, specific and useful cephalometric normative values. This separation was found to be significant in most of the variables used in the study.

The sample was selected carefully to include Yemeni adults, who had Class I skeletal and dental relationships and did not include subjects who had received orthodontic or facial surgical treatment. To insure a sample involving areas in all around Yemen, the sample was selected from the universities which in turn involve students from all cities of Yemen. A relatively large sample consisted of 105 Female and 89 male were involved in the study (18-25 years old).

Skeletal relationships

Anteroposterior

In the current study all the skeletal variables showed significant differences between genders except for SNA reading where the female had higher value. About the same measurement of SNA was found in Saudi[11] and Lebanese[21] Norms. In contrast, Emirates[15], Sudanese[22] and Germen[23] showed higher values. The SNB Variable was in line with the finding obtained by Hamdan[20] among Jordan population which is higher than that found among Saudi[11] and Lebanese[21] and lower than that of Emirates[15] and Sudanese[22]. The SNPg showed a similar
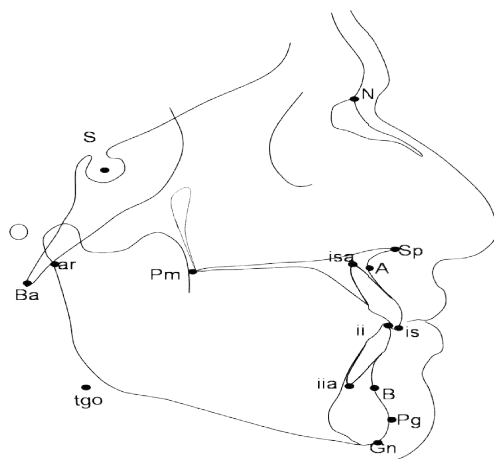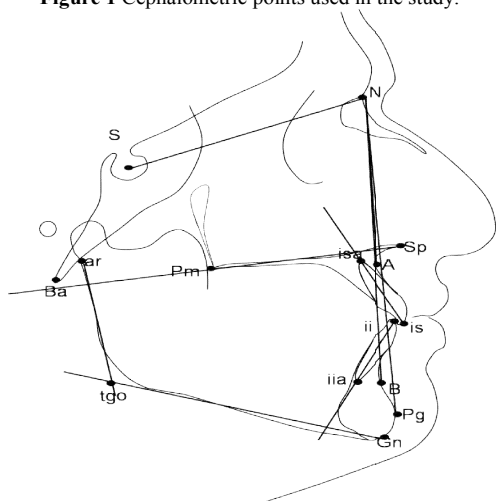
result to that of Egyptian[2] and different than other counties. The SNA, SNB and SNPg showed higher value in male than female while ANB and SNBa were lower in male. However, in other countries the opposite is true in some of these variables. This indicates that the Yemeni adults had completely different skeletal values.

Vertical inclination

In the present study, Male had lower values then female in ML-NL, NL-NSL and ML-NSL which are quite similar to that of Sudan.[22] Moreover, Emirates and Kuwait showed higher values.[15,16]

Face height

In the current study, Yemeni male had higher statistical significant upper and lower facial height (N-Sp' and Sp'-Gn) then female which in line with the results obtained by Abu-Tayyem *et al*,[15] Ibrahim,[22] and Naranjilla[23] among Emirates, Sudan and Filipinas respectively, but the opposite was seen in Egypt and Germen.[2,23] The upper facial height (N-Sp') was close to that of Emirates[15] and much more than that of Egyptian and Sudanese.[2,22] The lower facial height (Sp'-Gn) was much less than that of Emirates and much more than that of Sudan.[15,22]

Chin prominence

The present study showed a non significant difference among Yemeni genders in Nordeval angle and a highly significant difference in Pg-NB. The Pg-NB showed higher values in Yemeni male and female than Egyptian,[2] Sudanese,[22] Filipinos but less than that of German.[23] The Nordeval angle of both Yemeni genders was approximately like that of Sudanese and higher than that of German.[22,23]

Dental variables

In this study, the females tended to have greater bimaxillary proclination of the incisors than males, indicated by the smaller interincisal angle though not statistically significant. The same finding was seen in Saudis,[11] Kuwait,[16] and Sudan.[22] However, the opposite was found by Bishara[2] and also by Abu-Tayyem[15] in Egypt and Emirates. In general, this angle was found to be higher in Yemeni adults than that of Emirate,[15] Saudis,[11] Kuwait,[16] and Sudan[22] but less than that of German.[23]

CONCLUSION

- The skeletal sagittal relations and vertical inclination were significantly different among Yemeni gender.
- Yemenis have distinct cephalometric features, for which specific norms should be used as a reference in treating orthodontic patients.
- When compared with other population of Arabs, African or Europeans, the Yemeni Sample showed different measurements of the different variables which might resemble another population in few of the variables but different in other.

References

1. Koski K. The norm concept in dental orthopedics. Angle Orthod 1955; 25(2):113-117.
2. Bishara SE, Abdalla EM, Hoppens BJ. Cephalometric comparisons of dentofacial parameters between Egyptian and North American adolescents. Am J Orthod 1990; 97(5):413-421.
3. Franchi L, Baccetti T, Mcnamara J. Cephalometric floating norms for North American adults. Angle Orthod 1998; 68(6):497-502.
4. Downs BW. Variations in facial relationships: their significance in treatment and prognosis. Am J Orthod 1948; 34:812-40.
5. Altemus L. A comparison of cephalofacial relationships. Angle Orthod 1960; 10:223-240.
6. Carrillo El, Kubodera-Ito T, Gonzalez-Lopez B, Montiel-Bastida N, Esquivel-Pereyra G. Cephalometric Norms According to the Harvold´s analysis. Int J Odontostomat 2009;3(1):33-39.
7. Kuramae M, Magnani M, Boeck EM, Lucato AS. Jarabak 's Cephalometric Analysis of Brazilian Black Patients. Braz Dent J 2007; 18(3):258-262.
8. Drummond RA. A determination of cephalometric norms for the Negro race. Am J Orthod 1968; 54:670-686.
9. Connor AM, Moshiri F. Orthognathic surgery norms for American black patients. Am J Orthod Dentofac Orthop 1985; 87(2):119-134.
10. Miyajima K, McNamara J, Kimura T, Murata S, Iizuka T. Craniofacial structure of Japanese and European-American adults with normal occlusions and well-balanced faces. Am J Orthod Dentofac Orthop 1996; 110(4):431-438.
11. Hassan AH. Cephalometric Norms for Saudi Adults Living in the Western Region of Saudi Arabia. Angle Orthod 2006; 76(1):109-113.
12. Aldrees AM. Lateral cephalometric norms for Saudi adults: A meta-analysis. Saudi Dent J 2011; 23:3–7.
13. Uysal T, Yagci A, Adrees AM, Ekizer E. Ethnic differences in dentofacial relationships of Turkish and Saudi young adults with normal occlusions and well-balanced faces. Saudi Dent J 2011; 23:183–190.
14. AlBarakati SF, Baidas LF. Orthognathic surgical norms for a sample of Saudi adults: Hard tissue measurements. Saudi Dent J 2010; 22:133–139.
15. Abu-Tayyem HM, Alshamsi AH, Hafez S, ElDin EM. Cephalometric norms for a sample of Emirates adults. Open J of Stomatology 2011; 1:75-83.
16. Behbehania F, Hicks P, Beeman C, Kluemper T, Rayense MK. Racial Variations in Cephalometric Analysis between Whites and Kuwaitis. Angle Orthod 2006; 76:406–411.
17. Al-Jame B, Artun J, Al-Azemi, R Behbehani F, Behbehani S. Lateral Cephalometric Norms for Adolescent Kuwaitis: Hard Tissue Measurements. Med Princ Pract 2006; 15:91–97.
18. Uysal T, Yagci A, Adrees AM, Ekizer E. Ethnic differences in dentofacial relationships of Turkish and Saudi young adults with normal occlusions and well-balanced faces. Saudi Dent J 2011; 23: 183–190.

19. AlBarakati SF, Baidas LF. Orthognathic surgical norms for a sample of Saudi adults: Hard tissue measurements. Saudi Dent J 2010; 22:133–139.

20. Hamdan A M. Cephalometric Norms in an Arabic Population. Journal of Orthod 2001; 28:297-300.

21. Kassis A, Serhal JB, Nassif BN. Malocclusion in Lebanese Orthodontic Patients: An Epidemiologic and Analytic. *International Arab Journal of Dentistry*. 2010; 1(1):34-43. Available from: file:///C:/Users/ICC/Downloads/17-51-1-PB.pdf

22. Ibrahim E, Abu Affan A, Yahia N: Skeleto-dental and soft tissue relationship among a Sudanese sample: A Cephalometric study. University of Khartoum, Faculty of Dentistry, Department of Orthodontics.c2008. Available from: http: //research. uofk.edu /multisites/ UofK_research/images/stories/research/PDF/2011/poste rdental/skeleto-dental%20and%20soft%20tissue%20 relationship%20among%20a%20sudanese%20sample.p df

23. Naranjilla ASN, Janson IR. Cephalometric Features of Filipinos with Angle Class I Occlusion According to the Munich Analysis. Angle Orthod 2004; 75:63–68.

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