Localized hyperplastic lesions of the oral mucosa: A clinico-pathological study

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ABSTRACT

A retrospective study of (96) cases of mucosal hyperplastic lesions of the oral cavity was carried out. The distribution of the lesions in relation to the age, sex, size and the site of origin was performed. The result shows that these lesions affect similar age groups except denture induced hyperplasia, which affect older age group. Females were affected more than males especially for peripheral giant cell granuloma and denture induced hyperplasia. Fibro-epithelial polyp and fibrous epulis show smaller size than other types of the lesions. Majority of pyogenic granuloma and peripheral giant cell granuloma arised in the posterior part of the jaws, by contrast to other type of the lesions which show no difference in their site of origin.

Key Words: Connective tissue hyperplasia, oral mucosa, epulis, polyp.

الخلاصة

تم إجراء دراسة تراجعية لـ (٩٦) حالة من الآفات الموضعية الزائدة التنسّج في الغشـــاء المخـــاطي الفموي. تم إنجاز علاقة توزيع هذه الآفات نسبة للعمر، الجنس، الحجم ، وكذلك موقع الأصل. أظهرت نتـــائج الدراسة أن هذه الآفات تؤثر على أعمار متقاربة ماعدا آفة التنسّج المفرط بسبب طقم الأسنان والتي كانت فـــي أعمار متقدمة. الإناث كُنَّ متأثرات أكثر من الذكور وخاصة حالات الأورام الحُبيبية المرمـــّمة ذوات الخلايـــا العملاقة وآفات التنسّج المفرط بسبب طقم الأسنان. البوليبات الليفية الظهارية والأورام الليفية اللثويـــة كـــانت أصغر حجماً من بقية أنواع الآفات. غالبية الأورام الحُبيبية القيحية والأورام الحُبيبية المرمـــّمة ذوات الخلايـــا العملاقة ظهرت من النسيج المخاطي من الجزء الخلفي من الفكّين مقارنةً ببقيـــة الآفـــات حيـــث لـــم تظـــهر اختلافات في أصل مواقعها.

INTRODUCTION

Localized hyperplastic lesions of the oral mucosa are common. These lesions usually are responsive to chronic irritation. The inflammatory process and repair occur at the same time producing a granulation tissue. On the clinical and histopathological ground, several mucosal hyperplastic lesions can be distinguished. However, the majority are variations of the same disease process [(1)]. The colour of these lesions varies from dark red to relatively pink resembling the colour of adjacent mucosa. This depends on the vascularity of the lesions and the thickness of the covering epithelium. This reflects the duration of the lesions. The early developed lesions consist of a richly vascular mass of soft tissue, endothelial proliferation, and

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mixture of inflammatory infiltrate. Such lesions can justifiably named as **pyogenic granuloma**. Another group of lesions which collectively named as **fibrous overgrowth** include: fibrous epulis, fibroepithelial polyp, denture induced hyperplasia and papillary hyperplasia of the palate. In the histology of these lesions, a core of dense collagen fibers relatively acellular with scanty blood vessels and inflammatory infiltrate when ulcerated [2].

A distinct mucosal hyperplastic lesion at least histologically named **peripheral giant cell granuloma,** clinically this lesion resembling the foregoing mentioned hyperplastic lesions. This study is designed to find out the distribution in relation to age, sex, size, and site of occurrence of these lesions.

MATERIALS AND METHODS

Ninety six patients having mucosal hyperplastic lesions in the oral cavity were studied. Patients having such lesions were collected from the files of Oral Pathology Unit in the College of Dentistry, University of Mosul. Under local anesthesia, the lesions were exised and sent to oral pathologist. The materials were processed and haematoxylin and eosin stained sections were prepared. The final histopathologic reports were issued for cases included in the study. Data from the clinical and histopathological forms of the cases were collected. These include the age, sex, size, site, and histological typing of the cases. The obtained data were analysed and reported.

RESULTS

Following analysis of the data obtained from the cases, it was found that (28) cases were pyogenic granuloma and (10) cases were of peripheral giant cell granuloma. The remaining (58) cases were collectively named fibrous overgrowth. Of these, (16) were fibroepithelial polyp, (18) were fibrous epulis, and (24) cases were of denture induced hyperplasia. Table (1) shows the mean age, sex, mean size, and site of each type of the lesions. The result shows that females affected more than males by mucosal hyperplastic lesions except for pyogenic granuloma and fibrous epulis. This was very clear in denture induced hyperplasia and peripheral giant cell granuloma. Of (24) cases of denture induced hyperplasia (22) patients were females. In relation to age of the patients, it was shown that almost similar age groups are affected except for denture induced hyperplasia which affect older age groups. Fibroepithelial polyp and fibrous epulis show smaller mean sizes than other lesions. The majority of pyogenic granuloma and peripheral giant cell granuloma affect the posterior part of the jaws (upper and lower), namely the premolar and molar areas; whereas other lesions show no difference in their distribution in relation to the site.

Table (1): Sex, mean age, site, and the mean size in relation to the type of the lesions

Type of Lesions	Sex		Mean Age (Yrs)	Site			Mean Size (mm)
	Males	Females		Anterior	Posterior	Others	
Pyogenic Granuloma	16	12	33.0	6	20	2 (Tongue)	17.2
Peripheral Giant Cell Granuloma	2	8	29.4	2	8	-	23.4
FIBROUS OVERGROWTH:							
Polyp	8	8	39.0	-	-	8 (Cheek) 4 (Tongue) 2 (Lip) 2 (Palate)	6.2
Denture Induced Hyperplasia	2	22	53.2	-	-	14 (Upper) 10 (Lower)	20.3
Fibrous Epulis	12	6	30.4	10	8	-	9.2
TOTAL	40	56	-	-	-	-	-

DISCUSSION

Localized tumour – like lesions of the oral mucosa are common and asymptomatic. These lesions are hyperplastic and not neoplastic. This was confirmed by a study of series of (650) localized fibrous lesions from various parts of the oral cavity. Following a thorough investigation, only (2) lesions were suspected to true neoplastic of benign type [3].

Many terms have been applied to these lesions. This makes analysis of their incidence difficult. In a study of (500) consecutive cases, (73%) were of fibrous type, (17%) vascular and the remaining (10%) were of peripheral giant cell granuloma [4]. In this study, almost similar results were obtained. The high percentage of fibrous lesions can be explained by their nature. Because they are asymptomatic, the patient may take time for seeking treatment. This delay may lead changing vascular lesions, mainly pyogenic granuloma to a fibrous type.

An attempt to relate recurrence to the histological features of these lesions has largely unsuccessful, and in most cases failure to identify and remove local precipitating factors and failure to completely excise the lesions in the first instance are the main factors [5]. No follow – up data in relation to recurrences in this study are available. However, one of the cases with peripheral giant cell granuloma showed three recurrences following complete excision at four months interval. This may indicate the high recurrence rate of such lesions. No explanation is found for the variance in distribution of pyogenic granuloma and peripheral giant cell granuloma in

relation to the site. Probably forces of mastication applied on the posterior site may enhance proliferation of a chronically tissues in the area. Fibrous epulis and fibroepithelial polyps may developed from pyogenic granuloma when left untreated. Shrinking due to fibrous tissue formation may explain the smaller mean sizes of fibrous lesions by contrast with other mucosal hyperplastic lesions.

In conclusions, oral mucosal hyperplastic lesions are common and females affected more than males. Fibrous lesions are smaller in size than vascular type and majority of pyogenic granuloma and peripheral giant cell granuloma located at premolars and molars areas, and denture induced hyperplasia markedly affect older age groups than other lesions.

REFERENCES

1.Soams JV, Southam JC. Oral Pathology. Oxford University Press, Oxford Medical Publications. 1985.
2.Shafer WG, Hine MK, Levy BM. A Textbook of Oral Pathology. W.B. Saunders Company. 1983.
3.Burker DS, Lucus RB. Localized fibrous overgrowths of the oral mucosa. *Brit J Oral Surg*. 1967; 5: 86-90.
4.Lee KW. The fibrous epulis and related lesions. *Periodontol*. 1968; 6: 272-292.
5.Buchner A, Calderson S, Ramon Y. Localized hyperplastic lesions of the gingiva: a clinico-pathological study of 302 lesions. *J Periodontol*. 1977; 48: 101-104.

Skeletal dental base and dentoalveolar relationships in Iraqi adults (lateral cephalometric study)

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ABSTRACT

The purpose of this study is to develop cephalometric dental and skeletal dental base standards for the Iraqi adults in Mosul City. Lateral cephalometric radiographs were traced for 60 Iraqi adults (30 males and 30 females). All showed class I normal occlusion and age range was 18 to 25 years. Eleven cephalometric measurements (5 angular and 6 linear dentoskeletal measurements) were determined. Statistical analysis was performed to obtain the means and standard deviations. The comparison between Iraqi males and females indicated that the males had significantly longer maxillary and mandibular length than the females while the lower incisor was more proclined in female. Comparison of Iraqi sample with other population showed that both Iraqi sexes had significantly more protrusive maxilla and mandible than other population.

Key Words: Lateral cephalometric, dentoalveolar relationship, skeletal dental base.

الخلاصة

هدف هذه الدراسة هو إنشاء معيار للقياسات السنية والقاعدة السنية الهيكلية للعراقيين البـــالغين فـــي مدينة الموصل. رُسِمَت الأشعة القياسية الجانبية للرأس لِ (٦٠) عراقي بالغ (٣٠ ذكر و ٣٠ أنثـــى) وكلـــهم مصنَّفون على أنهم من الصنف الأول للإطباق الطبيعي للأسنان وبعمر يتراوح بين (١٨) إلى (٢٥) سنة، وتـم تسجيل (١١) قياس للرأس (٥ زوايا و ٦ مسافات سنية هيكلية)؛ وقد أُجرِي التحليل الإحصائي للحصول علـى القيم المعدّلية مع انحرافها المعياري. أشارت المقارنة بين الذكور والإناث العراقيين بأن الذكور يمتلكون فكـــاً علوياً وسفلياً أطول وبشكل ملحوظ من الإناث، بينما كان القاطع السفلي أكثر بروزاً فـــي الإنـــاث. أظـــهرت مقارنة المجتمع العراقي مع المجتمعات الأخرى أن العراقيين من كلا الجنسين كان لديهم بروز الفك العلـــوي والسفلي أكثر من بقية المجتمعات.

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INTRODUCTION

Cephalometric standards for one ethnic group did not necessarily apply to other ethnic groups and the differences in the dentofacial relationships of various ethnic groups have been observed.

Fonesca and Klein [1] studied a sample of 40 black women, aged 20 to 30 years, with angle class I occlusion, good health and no obvious facial deformities. They found that the maxilla and mandible had greater skeletal prognathism, greater upper and lower incisor height, and the lip protrusion were greater in black than in white women.

Jacobson[2] did a comprehensive study on the craniofacial skeletal pattern of southAfrica blacks. After analysing lateral cephalograms, he found no significant differences, in relation to whites, in the anterior extremity of the Maxilla or Mandible. Also discovered that the ANB angle of the blacks was significantly larger. The mandibular plane to SN was steeper in the blacks. He reported no significant difference in the ANS to Menton distance. In addition, he compared his norms to the Established American blacks norms and found similar measurements. He attributed the minor differences to the fact that the American black is mainly a mixture of African black, West European Caucasian, and Mongoloid (American Indian), as described by Hershovitz[3].

Connor and Moshiri[4] compared a sample of 50 blacks adults with a sample of 50 white adults, both groups having Angle class I occlusion. They found greater maxillary and Mandibular Skeletal prognathism, anterior dental height, and lower incisors proclination in blacks than in whites.

Compared with Caucasians, the Koreans have a similar skeletal patter, slightly larger facial convexity, a more protrusive and labially inclined maxillary and mandibular incisors and a larger ratio of lower molar height / lower incisor height.[5]

On comparing the white Brazilian adult sample with the North American Standards, statistically significant differences were found for Go-Gn/SN and SND angles, and statistically greater values of 1/NA (mm), 1/NB (mm) and 1/NA (degrees). [6]

Swierenga *et al.*[7] studied 48 Mexican-American adults (23 men, 25 women) aged 18 to 50 years. Selection criteria were with class I occlusion, minor or no crowding, good facial balance, no significant medical history or history of facial trauma, no previous orthodontic treatment or maxillofacial surgery, parents, and grand parent were born in Mexico. They compared their sample with black and white American, and significant racial and sexual differences were found in skeletal measurements (SNA, ANB, Pog-N ⊥, Co-A, Co-Gn, ANS-Me, Mp-FH, Mp-SN), and dental measurements (U1-A ⊥, L1-APog, U1-L1, $\overline{1}$ MPA).

Miyajima *et al.*[8] compared 54 Japanese adults (26 men and 28 women) with a sample of 125 adults (44 men and 81 women) of European-American ancestry who were selected on the basis of having normal occlusion and well-balanced faces. The Japanese sample in general was smaller in anteroposterior facial dimensions and proportionally larger in vertical facial dimensions and the facial axis angle was more vertical in Japanese subjects, indicating a more downward direction of facial

development. On average, the Japanese sample were more dental protrusive, with a more acute nasolabial angle and a greater tendency toward bilabial protrusion.

Although cephalometric studies have been done for Iraqi children and adolescence, [9-11] Very little has been studied on adults.[12, 13]

The purpose of the study is to establish cephalometric standards for skeletal dental base and dento-alveolar relationships for Iraqi adults in Mosul City.

MATERIALS AND METHODS

The Sample

Subjects included in this study were selected from Iraqi adults, 30 males and 30 females, in Mosul University with 18-25 years of age. They have full set of permanent teeth in both jaws (excluded third molar), a bilateral class I molar and canine relationships which are based on angle classification with normal overbite and overjet ranging from 2-4 mm, with no apparent dental discrepancy. These subjects had harmonious facial features, had not under gone orthodontic treatment or maxillofacial surgery or extensive restorative dentistry, no significant medical history of facial trauma.

A lateral cephalogram was taken for each subject under rigidly standardised condition using S.S. white cephalometric machine with a wehmer cephalostate (Model W-105A). The tracing procedure was done according to Jacobson and Caufield[14].

Cephalometric Landmarks

Figure 1 shows the following landmarks used in this study which were located according to Steiner, [15] Chaconas,[16] Swuerenga *et al.*[7] and Houston *et al.*[17].

Sella turcica (S): centre of the bony cryp occupied by the hypophysis cerbri or the hypophyseal gland.

Nasion (N): Intersection of the frontonasal suture with the internasal suture in the midsagittal plane.

Orbitale (Or): lowest point on the inferior bony margin of the orbit, the point used is halfway between the right and left orbitale.

Point A (A): Most posterior mid line point in the anterior concavity of the maxilla between the anterior nasal spine and the crest of the maxillary alveolar process.

Point B (B): Most posterior mid line point in the concavity of the incisive fossa of the anterior of the mandibular symptoms between the crest of the alveolar process and the symphysis.

Pogonion (Pog): Most prominent point on the anterior aspect of the symphysis of the mandible.

Porion (Po) (anatomic porion): most superior point of the bony external auditary meatus. If two can be seen the point used in halfway between the right and left portion.

Condylion (Co): Most posterior superior point on the outline of the mandibular condyle. The point used is halfway between the right and left image.

Gnathion (Gn): Most outward and everted point on the symphysis of the mandible.

Point D (D): A point at the centre of the cross section of the body of the symphysis.

Prosthion (Pr.): The intersection of the alveolar crest and the outline of the most prominent maxillary incisor.

Infradentale (Id): The intersection of the alveolar crest and the outline of the most prominent mandibular incisor.

Incision superius (Is): The tip of the crown of the most prominent upper incisor.

Incision inferius (II): The tip of the crown of the most prominent lower incisor.

Cephalometric Measurements

From the various landmarks described 7 skeletal variables (3 angular and 4 linear measurements) as shown in Figure (2) and 4 dental variables (2 angular and 2 linear measurements), as shown in Figure (3), were recorded to the nearest 0.5 (degree or millimetre).

Skeletal Measurements

Nasion perpendicular constructed from a line drawn perpendicular to Frankfort horizontal plane through nasion, and extending below the image of the mandible.

Linear Measurements

- A point to nasion perpendicular (A-N⊥): Distance between A point and the nasion perpendicular line measured perpendicular to the nasion perpendicular line.
- Pogonion to nasiobn perpendicular (Pog-N): Distance between A pogonion and nasion perpendicular line measured perpendicular to the nasion perpendicular line.
- Condylion to A point (Co-A): Effective mid-face length measurement is made on a line drawn from condylion to A-point.
- Condylion to gnathion (Co-Gn): Effective mandibular length: measured is made on a line drawn between condylion and gnathion.

Angular Measurements

- SND: As an assessment of the position of the mandible in its anteroposterior relationship to the rest of the skull.
- S.N.Pr.: Anteroposterior position of alveolar part of premaxilla.
- S.N.Id: Anteroposterior position of alveolar part of mandible.

Dental Measurements

Linear Measurements

- Upper incisor to NA (U1-NA): This measurement indicates the anteroposterior distance of the incisal edge of the upper central incisor to NA line.
- Lower incisor to NB (L1-NB): This measurements gives an indication of the anteroposterior distance of the lower central incisor with reference to (NB) line.

Angular Measurements

- Upper incisor to NA (U1/NA angle): This angle indicates the inclination of the upper central incisor.
- Lower incisor to NB (L1/NB angle): This angle indicates the inclination of the lower central incisor.

Calibration Procedure

Intra-examiner calibration was done by repeating the entire tracing procedure and measurements of 10 radiographs by the same operator after one month. Inter-examiner calibration was carried out by repeating all tracing procedure and measurements for all 10 radiographs by another well trained orthodontist The results showed that no significant differences were found at level of $p< 0.05$. It was concluded that our calibration procedure is reproducible and can be relied on in our forthcoming procedures.

Analysis of the Data

The data analysed by using SPSS program, which included mean standard deviation, minimum and maximum values were computed for each variable. Using t-test made statistical comparison of the Iraqi males and females.

F-values were calculated and if significant at $F \leq 0.05$. Duncan Multiple range test was performed to compare the Iraqi adult sample with the other population samples.

RESULTS

Table (1) contains the Iraqi adults finding for this study including mean, standard deviation, minimum and maximum values for skeletal and dental variables of males, females and total sample. Table (2) contains the comparison data between the Iraqi male and female group.

Table (1): Descriptive statistics of Iraqi adult skeletal and dental variables.

Variable	Male*				Female**				Total			
	Mean	SD	Min.	Max.	Mean	SD	Min.	Max.	Mean	SD	Min.	Max.
A – N ⊥ (mm)	3.40	3.39	-7.00	10.50	3.64	3.40	-3.00	9.00	3.52	3.37	-7.00	10.50
Pog – N ⊥ (mm)	2.95	6.66	-14.00	17.00	1.17	6.88	-13.00	14.00	2.06	6.77	-14.00	17.00
Co – A (mm)	99.00	4.42	90.00	107.00	92.78	4.75	83.00	103.00	95.89	5.52	82.00	107.00
Co – Gn (mm)	131.14	7.81	109.00	147.00	122.31	6.06	112.00	136.00	126.72	8.24	109.00	147.00
S. N.D (°)	78.09	8.85	70.00	89.00	77.45	2.68	73.50	83.50	77.77	3.30	70.00	89.00
S.N. Pr. (°)	85.16	4.16	77.00	95.50	86.12	2.89	80.50	93.50	85.64	3.58	77.00	95.50
S.N. Id. (°)	82.28	4.08	74.00	93.50	82.28	2.89	76.50	89.00	82.28	3.51	74.00	93.50
U1/NA (°)	23.66	5.00	14.00	32.00	22.28	6.23	5.50	37.00	22.97	5.64	5.50	37.00
L1/NB (°)	24.84	4.49	17.00	37.00	27.70	5.12	19.00	38.00	26.28	4.99	17.00	38.00
U1-NA (mm)	4.45	2.25	-1.00	8.50	3.76	2.68	-1.00	10.00	4.11	2.48	-1.00	10.00
L1-NB (mm)	5.32	2.10	3.00	9.00	5.67	2.55	1.50	10.00	5.50	2.32	1.50	10.00

* Male (n = 30), ** Female (n = 30), mm = millimeters, (°) Degree

Table (2): Comparison of dentoskeletal variables between Iraqi male and female-groups.

Variables	Male		Female		Confidence of the difference		t-value	Sig.
	Mean	SD	Mean	SD	Lower	Upper		
A – N ⊥ (mm)	3.40	3.39	3.64	3.40	-2.03	1.55	-0.271	N.S.
Pog – N ⊥ (mm)	2.95	6.66	1.17	6.88	-1.79	5.34	0.999	N.S.
Co – A (mm)	99.00	4.42	92.78	4.75	3.81	8.64	5.16	S.
Co – Gn (mm)	131.14	7.81	122.31	6.06	5.15	12.51	4.80	S.
S. N.D (°)	78.09	8.85	77.45	2.68	-1.11	2.38	0.733	N.S.
S.N. Pr. (°)	85.16	4.16	86.12	2.89	-2.85	0.92	-1.02	N.S.
S.N. Id. (°)	82.28	4.08	82.28	2.89	-1.86	1.86	0.000	N.S.
U1/NA (°)	23.66	5.00	22.28	6.23	-1.59	4.35	0.930	N.S.
L1/NB (°)	24.84	4.49	27.70	5.12	-5.39	-0.33	-2.26	S.
U1-NA (mm)	4.45	2.25	3.76	2.68	-0.63	1.98	1.03	N.S.
L1-NB (mm)	5.32	2.10	5.67	2.55	-1.57	0.89	-0.562	N.S.

N.S.= Non significant S = Significant at $p \leq 0.05$

Table (3) shows the Iraqi adult male dento-skeletal values compared with dento-skeletal values of other population males.

Table (3): Comparison of dentoskeletal variables of the Iraqi males with the other populations.

Author	Origin	Age	Size	A–N ⊥ (mm)	Pog–N ⊥ (mm)	Co–A (mm)	Co–Gn (mm)	S.N.D (°)	S.N. Pt (°)	S.N. Id (°)	U1/NA (°)	L1/NB (°)	U1-NA (mm)	L1-NB (mm)
Present study 2001	Iraqi	18-25y	n = 30	3.39a	2.94a	99.0a	131.13a	78.08a	85.15	82.28	23.65cd	24.84	4.45cd	5.33e
Miyajima et al. 96	Japanese	20-25y	n = 26	2.5b	0.3b	91.4b	125.5b							
	European American	36y	n = 44	1.0c	-0.3bc	99.8a	132.3a							
El-Fakhri 94	Libyan	18-25y	n = 30	-1.46e				76.4a			23.18de	29.33c	5.03 bcd	5.80de
Swierenga et al. 91	Mexican	18-50y	n = 32	0.61d	-1.31d	99.09a								
Connor and Moshiri	North American White	18-50y	n = 25	0.96c	-0.43c	89.78b	125.10b							
Shalhoub et al. 87	Saudi	20-46y	n = 24			90.04b	115.58c							
Park et al. 89	Korean	18y	n = 35					76.6a			24.2c	28.1d	7.2a	7.5cd
Kowalski et al. 75	Black	20-50y	n = 177								32.86b	30.80c	5.00 bcd	9.45ab
	White	20-50y	n = 300								33.53ab	20.52c	3.85d	4.63e
	Sioux	20-50y	n = 65								34.73a	30.66c	4.19cd	7.88bc
	Cosbinabua	20-50y	n = 31								23.67cd	34.57b	2.11e	7.58 bcd
Jacobson 78	South Afri Negro	adult	n = 23								18.1f	40.7a	6.2ab	9.9a
	Caucasoid										18.5f	25.4e	5.6abc	4.9c

Means with same letters horizontally indicates no significant difference.

Table (4) illustrates the dentoskeletal values of Iraqi female compared with dentoskeletal values of other population females.

Table (4): Comparison of dento-skeletal variables of the Iraqi females with the other populations.

Author	Present study 2001	Miyajima et al. 96		El Faituri 94	Sweireng a et al. 94	Connort and Moshiri	Shalhoub et al. 87	Park et al. 89	Fonesca 78		Jacobson 78	
Origin	Iraqi	Japanese	European American	Libyan	Mexican	North American White	Saudi	Korean	Am Negro	Caucasian	South Afri Negro	Caucasoid
Age	18-25y	20-25y	36y	18-25y	18-50y	18-50y	20-46y	18y	20-30y		adult	
Size	n = 30	n = 28	n = 81	n = 30	n = 25	n = 25	n = 24	n = 45	F = 40		n = 24	
A – N ⊥ (mm)	3.64a	2.3b	0.5d	-1.31 e	1.72c	0.52d						
Pog– N ⊥ (mm)	1.17a	-1.7b	-1.8b		-2.92c	-1.72c						
Co – A (mm)	92.77a	86.3d	91.4b		90.52 c	91.56 b	87.20 d					
Co – Gn (mm)	122.31 ab	118.8 b	120.2a ba			120.3 1ab	113.9 0c					
S. N.D (°)	77.45a			75.76 a				75.0a				
S.N. Pr. (°)	86.12											
S.N. Id. (°)	82.27											
U1/NA (°)	22.27b			23.28 b				22.6b	26.1a	23.1b	17.8f	21.6f
L1/NB (°)	27.70c d			29.33 c				26.7d	38.5b	23.9e	41.5a	24.7e
U1-NA (mm)	3.77d			4.95c d				6.8ab	6.6ab c	3.4d	5.8ab c	5.1bc d
L1-NB (mm)	5.67cd			5.88c d				6.9c	9.3b	4.6d	9.6ao	4.7d

Means with same letters horizontally indicates no significant difference.

DISCUSSION

Generally, the comparison for the mean values of the skeletal and dental variables including angular and linear measurements between male and female groups are presented in Table II and the results of this study have been compared with other adult populations as illustrated in Table III and IV reflect the differences in the mean values which could be attributed to the effect of ethnic variation.

Sex Differences within Iraqi Populations

Comparisons between the Iraqi males and females indicated that the males are significantly greater than Iraqi females in two linear skeletal measurements (Co-A, Co-Gn). This is to be expected since males are in general larger than females. This findings support the findings of McNamara[18] for adult European American and Miyajima *et al.*[8] for Japanese adults, in addition to the finding of Connor and Moshiri[4] for the mandibular length (Co-Gn) between the white males and females and in contrast to Shalhoub *et al.*[19] who found no significant differences in the maxillary and mandibular length between Saudi males and females.

No significant difference in the position of point A and pogonion relative to the nasion perpendicular. It is noted worthy that MacNamara[18] for European American, Swierenga *et al.*[7] in their study for Mexican-American adult and Miyajima *et al.*[(8)] for Japanese adults found similar findings. In addition there is no significant difference in the chin position (SND) between Iraqi males and females. This is in accordance to El-Faituri[20] for Libyan population.

Concerning the dental variables, the lower incisor was more protrusive in female than in male. This may be attributed to compensatory mechanism for retruded mandible in the female to appear in the more natural appearance.

No significant differences were observed in the other dental variables.

Comparison of Iraqi Males with the Males of Other Populations

Skeletal Measurements

The maxillary and mandibular protrusion of Iraqi males was significantly greater than that for Japanese, European-American, North American White, Mexican and Libyan.

The maxillary and mandibular lengths (Co-A, Co-Gn) for Iraqi males were significantly longer than that of North American White, Saudi and Japanese. On the other hand, the Co-A and Co-Gn were similar and not statistically significant as compared with that of the European-American and Mexican.

No significant difference was seen in the chin position (SND) for the Iraqi males than that of the Libyan and Korean population.

For the anterposterior position of maxillary and mandibular alveolar ridge (S.N.Pr and S.N.Id), there is no data available in the literatures to compare with other population.

Dental Measurements

The angulation of upper incisor (U1/NA) for Iraqi males was significantly greater than that of Caucasoid and South African Negro and significantly smaller than that of Black and Sioux. This parameter showed close similarity with those of Libyan, Korean and Koshinahua.

The angulation of lower incisor (L1/NB) of Iraqi males showed similarity with those of Libyan and Caucasoid but measured significantly smaller than those of Korean, Black, Sioux, Coshinahua and South African Negro. While this measurement was greater for Iraqi male than that of white.

The upper incisor prominence from NA line (U1-NA) for Iraqi males exhibited most similarity to that of Libyan, Black. White, Sioux, and Caucasoid although this measurement of Iraqi male was significantly more protruded than Coshinahua and less protruded than Korean and South African Negro.

The position of lower incisor relative to NB line (L1-NB) of Iraqi male showed a close similarity and no significant difference with those of Libyan, white and Caucasoid, whilst the Iraqi male showed a significantly smaller value of (L1-NB) than that of Korean, Black, Sioux, Coshinahua and South African.

Comparison of the Iraqi Females with the Females of Other Populations

Skeletal Measurements

The greatest skeletal differences between the Iraqi females and the females of other population (North American white, European American, Libyan, Mexican and Japanese) were seen in the maxillary and mandibular protrusion. the Iraqi female showed no significant difference in the chin position (SND) in relation to the Libyan and Korean population.

The mid-facial length (Co-A) of Iraqi female was significantly greater than that of the European American and Mexican. Iraqi female has larger mid facial length than that of Japanese, North American white and Saudi.

There is no significant difference in the mandibular length (Co-Gn) for the Iraqi female with the Japanese and North American white but shows greater mandibular length than in Saudi.

Dental Measurements

No significant difference were observed in the relationship of the maxillary and mandibular incisor, to the NA and NB line respectively, between the Iraqi and the Libyan females. The Iraqi female had a larger maxillary incisor angulation than in South African Negro.

The Iraqi female had no significant difference in the upper incisor angulation to that of Caucasoid. In addition there is no significant difference to the Caucasian while a smaller maxillary incisor angulation than in American Negro.

The Iraqi female exhibited no significant difference in the mandibular incisors angulation as compared with the Korean and had a more proclined

mandibular incisor than that of Caucasian and Caucasoid. In addition the Iraqi female has a more retroclined mandibular incisor than that of American Negro.

Similar finding were observed for the maxillary and mandibular incisor position (U1-NA, L1-NB) for the Iraqi female when compared with the Libyan and Caucasoid and a more retruded maxillary and mandibular incisor for the Iraqi female than that of South African Negro and American Negro. But the Iraqi female had no significant difference in the lower incisor position (L1-NB) to that of Korean population.

The results of this study support the findings of other investigators (Cotton *et al.*[21]; Kowalski *et al.*[22]; Fonesca[1]; Jacobson[2]; Connor and Moshiri[4]; Shalhoub *et al.*[19]; Park *et al.*[5]; El-Faituri[20],; Swierenga *et al.*[7]; Miyajima *et al.*[8] who noticed the variation of the skeletal and dental Morphology in different ethnic groups. All these investigators stated that normal measurements of one group should not be considered normal for other racial groups. Different racial groups must be treated according to their own individual characteristics.

CONCLUSIONS

- Standards for (11) skeletal dental base and dentoalveolar measurements for adult Iraqi population in Mosul City were established. These cephalometric measurements would provide a base line aid for the
- Diagnosis, treatment planning and prognosis of orthodontic and orthognathic surgery.
- Comparison of the Iraqi males and females showed that the males were significantly larger than the females in the maxillary and mandibular length, whereas the lower incisor (L1/NB) was significantly more protrusive in female. The other skeletal and dental measurements showed no significant difference between the two sexes.
- Differences were observed in the dentoskeletal measurements between the Iraqi adult sample in Mosul City and other population and the greatest dentoskeletal differences were seen that both Iraqi sexes had more protrusive maxilla and mandible than other population samples.

REFERENCES

1. Fonscea RJ, Klein WD. A cephalometric evaluation of American Negro women. *Am J Ortho.* 1978; 73: 152-60.
2. Jacobson A. The craniofacial skeleton of the South African Negro. *Am J Ortho.* 1978; 73: 681-91.
3. Hershovitz M. The American Negro: a study in racial crossing, New York. Alfred A Knopf, Inc. 1928.
4. Connor AM, Moshiri F. Orthognathic surgery norms for American black patients. *Am J Ortho.* 1985; 87: 119-34.
5. Park I, Bowman D, Klapper L. A cephalometric study of Korean adults. *Am J Ortho Dentofacial Orthop.* 1989; 96(1): 54-9.

6. Cerci, V, Martins JE, De-Oliveria MA. Cephalometric standards for white Brazilians. *Int J Adult Orthod Surg*. 1993; 8(4): 287-92.

7. Swierenga D, Oesterle LJ, Messersmith ML. Cephalometric values for adult Mexico-Americans. *Am J Ortho Dentofacial Orthop*. 1994; 106(2): 146-55.

8. Miyajima K, McNamara JA, Kimura T, Murata S, Lizuka T. Craniofacial structure of Japanese and European American adults with normal occlusion and well-balanced faces. *Am J Ortho Dentofacial Orthop*. 1996; 110(4): 431-8.

9. Ali FA. Skeletodental characteristics of some Iraqi children at 9, 10 years of age, cephalometric study. MSc. thesis submitted to the College of Dentistry, Baghdad University. 1988.

10. Odeh FD. Cephalometric evaluation of pretreatment orthodontic patients. *Iraqi D J*. 1989; 14: 196-200.

11. Al-Sahaf NH. Cross-sectional study of cephalometric standards and associated growth changes. MSc. thesis submitted to the College of Dentistry, Baghdad University. 1991.

12. Al-Katifi BSh. Prosthodontic cephalometric standards as their relation to facial type in Iraqi adult sample (radiographic cephalometric study). MSc. thesis submitted to the College of Dentistry, Baghdad University. 1994.

13. Al-Sayagh NM. Dentoskeletal analysis and facial types of Iraqi adults in Mosul city with class I normal occlusion (lateral radiographic cephalometric study). MSc. thesis submitted to the College of dentistry, Mosul University. 1999.

14. Jacobson A, Caufield PW. Introduction to Radiographic Cephalometry. Philadelphia. Lea and Febiger. 1985.

15. Steiner CC. Cephalometric in clinical practice. *Angle Orthod*. 1959; 29(1): 8-29.

16. Chaconas SJ. Postgraduate dental handbook Orthodontics. John Wright and Sons Ltd., England. 1982.

17. Houston WJB, Stephens CD, Tulley WJ. A textbook of orthodontics. 2nd Edn. Hartnolls Ltd., Bodmin, Cornwall. Great Britain. 1996.

18. McNamara JA. A method of cephalometric evaluation. *Am J Ortho*. 1984; 86: 449-69.

19. Shalhoub SY, Sarhan OA, Shaikh HS. Adults cephalometric norms for Saudi Arabians with a comparison of value for Saudi and North American Caucasians. *Brit Dent J*. 1987; 14(2): 273-9.

20. El-Faituri H. Cephalometric norms for Libyan population. *Arab Dent J*. 1994; 1: 35-46.

21. Cotton WN, Takana WS, Wong WW. The Downs's analysis applied to three other ethnic groups. *Angle Ortho*. 1951; 21: 213-220.

22. Kowalski CV, Nasjleti C, Walker GF. Dentofacial variations within and between four groups of adult American males. *Angle Orthod*. 1975; 45: 146-50.