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SEX DETERMINATION IN SYRIANS BY USING METRICAL PARAMETERS ON MANDIBLE: A RADIOLOGICAL STUDY

Mohammad Halal[1], Marwa Zaghloule[2], Majid Aljaber Abo Fakher[3], Mahmoud Abdul-Hak[4] , Amr Zitawi[5]

1.Student in Faculty of Dentistry, International University for Sciences and Technology, Syria
2.Graduate from Faculty of Dentistry, International University for Sciences and Technology, Syria
3.PhD student, Department of Oral Medicine, Faculty of Dentistry, Damascus University, Syria
4.Head of Department of Oral Medicine, Faculty of Dentistry, Damascus University, Syria
5.MSc student, Department of Orthodontics, Faculty of Dentistry, Tishreen University, Syria

ABSTRACT:

Background: Syria has been witnessing an armed conflict for more than seven years, leaving daily human victims with burned bodies and bodies' remains that need to be recognized by forensic experts**.** There is a significant role for forensic dentistry in the process of recognition, and mandible has more bone hardness, permanence and variation in its shape according to gender.

Objectives: To evaluate sexual differences in some measurements of mandibular bone and to assess the accuracy of these measurements in sex determination.

Materials and Methods: 161 digital panoramic radiographs (80 males and 81 females) were included in this study, and the parameters (Cdl-Go, Go-Gn, gonial angle, minimum ramus breadth, MF-LMB) were analyzed for differences between males and females.

Results: There were statistically significant differences between males and females in the parameters (Cdl-Go and MF-LMB), but there were not such statistically significant differences in the parameters (Go-Gn, gonial angle and minimum ramus breadth). This study showed that the accuracy of sex prediction based on these parameters was 68.3%.

Conclusion: This study showed that some of the standard parameters on mandible in Syrian society can carry an important indication in sex determination process, and the distance between Condylon point and Gonion point has the highest percentage of gender differences

Keywords: forensic dentistry, mandible, sex determination, Syria.

INTRODUCTION:

Syria has been witnessing an armed conflict for more than seven years, leaving daily human victims with burned bodies and bodies' remains that need to be recognized by forensic experts**.**

Forensic medicine has the main role in the process of identification and determination of gender, stature, age and ethnicity of the human body studied.

Determination of victim's sex is one of the first and most necessary steps of identification, taking into consideration that it allows forensic exception of only half of the population.[1]

When soft tissue and external features of the individual are destroyed, experts can use the skeleton to determine the sex of the body or identify the remains of the body.[2]

Study of sexual dimorphism is important for researches in the field of anthropology and forensic medicine.[3]

*Corresponding Author Address: Dr. Mohammad Halal. E-mail: mohammad.b.halal@hotmail.com

Pelvic bone is essential for carrying out sex determination with a reliability level of up to 95% followed by cranial bone with a reliability level of 92%, but the bones of the pelvis are often exposed to loss or fragmentation after death due to their large size and fragility.[4]

There is a significant role for forensic dentistry in the process of recognition (especially sex determination). Mandible has more bone hardness, permanence and variation in its shape according to gender,[3] and that's due to the different muscle strength which is bigger in males.[5]

The destruction of soft tissues, the disappearance of the distinctive features of the body and the fragility of ancient bodies such as mummies or even the remains of bones in the archeological tombs have emphasized the importance of radiological studies in forensic medicine and sex determination process.

A recent study found that 87.5% of radiological studies in adults showed significant sexual dimorphism, so it is a strong indication of the importance of mandible in sex determination. Also, the development of digital radiography which allows us to take more accurate and less radiation-sensitive measurements, in addition to the modern 3-D imaging techniques such as CT and CBCT, have supported this approach.[6]

Characteristics of skeleton are different between races,[7] which confirms the need for studies for each community separately. And because of the scarcity of studies and scientific researches in the field of forensic dentistry and recognition within our community we conducted this study that aims to:

a-Evaluate sexual differences in some measurements of mandibular bone.

b-Assess the accuracy of these measurements in sex determination.

MATERIALS AND METHODS:

Three hundred and fifty (350) digital panoramic radiographs were randomly collected from Damascus Rural Area Radiography Center, which operates a (PaX-Primo, Vatech) device.

Patients aged between 18 and 60 years.

After applying exclusion criteria, the number of images in this study has become 161 images. 80 males and 81 female.

Exclusion criteria:

Images with one or more of these characteristics were excluded from the sample:

1) Big radiopaque or radiolucent lesions on mandible.
2) Congenital defects.
3) Missing lower molars and premolars.
4) Distorted images through imaging or development procedures.
5) Mental foramen not clear.
6) Periodontal lesions.

7) Fractured ramus or asymmetry between the two rami.

After applying exclusion criteria, these landmarks were identified:

a) Condylon (Cdl): the most upper distal point of condyle.

b) Gonion (Go): the most inferior distal point of mandibular angle.

c) Gnathion (Gn): the most anterior-inferior point of mandible.

d) Mental foramen (MF): the most inferior point of mental foramen.

e) Gonial angle (GA): the internal angle between the three points (Cdl-Go-Gn).

f) Minimum Ramus Breadth mRbr: the narrowest distance between two points: one on the distal border of the ramus and the second on the mesial border of the same ramus at a line parallel to the occlusal plane.

g) LMB: Lower mandible border expressed by a line between Go and Gn. The distance between these two points refer to the length of mandible body.

RESULTS:

The statistical analysis was conducted using SPSS (Statistical Package for the Social Sciences) version 20.

Kolomogrov-Smirnov test showed that the sample was distributed naturally, so t-test was applied on the independent samples. (Table 1) shows the 2-tailed t-test results.

Table1; T-test analysis.

		Levene's Test for Equality of Variances				
		F	Sig.	T	Df	Sig. (2-tailed)
Cdl-Go	Equal variance assumed	8.979	.003	7.710	159	.000
	Equal variance not assumed			7.694	143.544	.000
Go-Gn	Equal variance assumed	4.914	.028	1.986	159	.490
	Equal variance not assumed			1.984	154.209	.490
Gonial angle	Equal variance assumed	5.974	.016	-.330	158	.742
	Equal variance not assumed			-.329	146.766	.743
mRbr	Equal variance assumed	1.966	.163	.715	159	.476
	Equal variance not assumed			.714	154.221	.476
MF-LMB	Equal variance assumed	1.649	.201	3.256	159	.001
	Equal variance not assumed			3.252	154.112	.001

The main difference between males and females was the distance between Cdl point and Go point, and it was statistically significant (P = 0.00 <0.05). The average measurement was (78.28) mm in males and (70.51) mm in females.

The difference in distance between the lowest point of mental foramen and the lower border of mandible (MF-LMB) between males and females was also statistically significant (P = 0.001 <0.05). The average measurement was (14.9157) mm in males and (13.8347) mm in females.

Length of mandible body, gonial angle and minimal ramus breadth did not show any statistical significance for sex determining.

Binary Logistic Regression (BIN) was used to investigate the accuracy of the predictability and reliability of statistically significant parameters in determining sex, and this study showed that the accuracy of sex prediction based on these parameters was 68.3%.

DISCUSSION:

Determination of sex from skeletal remains is a major task in forensic sciences, especially in cases of mass disasters and crimes.

The study of jaws and teeth is important in sex determination through several methods. Some of which depend on the formal description of bones, but the accuracy in this way varies between examiners, so we depend on metric measurements which is more reliable.[8]

Therefore, this study relied on the use of digital panoramic radiographs, and it measured five parameters in the lower jaw by the engineering software (AutoCAD).

Mandible plays an important role in the identification process. It is the last bone that stops its growth among skull bones, and strongly influenced by the growth peak as the size and shape of the ramus changes in addition to its hardness and permanence.[9]

According to de Oliveira et al.,[10] mandibular parameters are unable to predict sex under 16 years of age, so the sample was selected above the age of (18).

Panoramic radiographs have many features, including covering a wide area of the jaws, a short dose of radiation and they are the most widely available radiograph and the most commonly used in dentistry.[11]

This study found statistical differences between males and females in some of mandibular parameters, where the distance between (Cdl) point and (Go) point showed the highest difference between the two genders. The mean distance was (78.82) mm in males and (70.51) mm in females with P value of (P = 0.000)

Several studies in the medical literature like the studies of G. V et al.,[2] Lopez-

Capp et al.,[7] Indira et al.,[8] Sairam et al.,[11] Saini et al.,[12] Dong et al.,[13] and Samatha et al.[14] are compatible with this result, and this is a strong evidence of the importance of this parameter in sex determination.

Our study is also similar to that of Ayoub et al.[15] on the Lebanese society, which is ethnically similar to our study community. The study of Ayoub et al. showed that the measurement of gonial angle on lateral cephalometric radiographs did not exhibit significant differences between males and females. Al-Shamout et al.[16] found in her study on mandible that the mandibular angle differs with age, and this may be attributed to the decrease in muscular effectiveness with age.

But our study differed with the study of Damera et al.[17] in the Indian society using panoramic radiographs. His study showed a statistical significance of (P = 0.020) in the measurement of gonial angle. This is consistent with many studies like the ones of Suragimath et al.[5] where (P = 0.0001) and Chandra et al.[3]

This study showed that the difference in distance between Go point and Gn point (length of mandible body) between the two genders was not statistically significant (P = 0.49). In contrast, this measurement showed a higher statistical significance in Indian society according to Sambhana et al.[18] study by using panoramic radiographs.

This study also showed that the parameter mRbr did not show statistical significance between the two genders (P = 0.476). In contrast, this parameter has shown statistical significance in the Indian society, according to More et al.[9] and Sambhana et al.[18] The variance of results between our study and the study of More et al.[9] which used panoramic radiographs may be due to the inter-ethnic differences in skeleton. In addition, the study of Lopez-Capp et al.[7] on Brazilian society which used CT images was different from our study in the results, and this may be due to ethnic differences among communities or the use of three-dimensional imaging.

CONCLUSION:

This study showed that some of the standard parameters on mandible in Syrian society can carry an important indication in sex determination process, and the distance between Condylon point and Gonion point has the highest percentage of gender differences and is one of the most important parameters on mandible.

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