Awareness And Knowledge About Orthopantomogram Study On Minimum Mandibular Ramus Width In Determination Of Sex Using (Right Side) South Indian Population.

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ABSTRACT

Aim : The aim of the present study is to determine sex of the individuals using mandibular ramus width (right side).

Introduction: Sex determination as a cornerstone of identification is at the same time an important aspect of forensic anthropology and in forensic examination. Measurements of the mandibular ramus typically reveal more gender differences than those of the mandibular body, and measurements of the mandibular ramus typically reveal more sexual dimorphism

Materials and methods: This study was conducted in the department of Forensic Odontology. A retrospective study was conducted using an orthopantomograph of 60 subjects (30 males and 30 females). Their ages ranged from 41 to 50 years.

Results and discussion: In the present study comprising 30 males and 30 females; The mean standard deviation for male is 35.9667 + 4.02264 and the mean + standard deviation for female is 36.7567 + 4.90487. The mandible is considered to be the best bone for determining sex because of its distinct characteristics, which include being the largest, strongest, and sexually dimorphic bone of the skull as well as frequently being recovered substantially intact. The condylar area and mandibular ramus undergo the most morphological transformations during growth in terms of size and remodelling.

Conclusion: The study concluded that the minimum mandibular ramus width of females is 36.76 and that of male is 35.96 stating that females have larger mandibular width than males. From the results it can be concluded that minimum mandibular ramus width is one of the best parameters in sex determination.

Keywords: Dimorphic, Forensic, Identification, Mandibular Ramus, Sex determination

INTRODUCTION

Legal requirements are the main justification for human identification. Additionally, it is necessary on a humanitarian basis. The first stage in any identification process is determining the person's sex. (1)Sex determination as a cornerstone of identification is at the same time an important aspect of forensic anthropology and in forensic examination. The main purpose of identification is to determine gender; track age, stature, ethnic and gender-dependent population estimates.(2)(3)

Using a complete skeleton, sex analysis and estimation was performed with close to 90-100% accuracy in identifying morphological features in sex determination.(4) On the other hand, it can be difficult to scan for identification when incomplete or fragmented bones and bodies are severely damaged, such as in the event of a mass disaster.(5)

Following the pelvis, the skull is considered the second best feature in sex determination.(6) However, if a completely dry skull is not found, the mandible is the largest, hardest, and dimorphic bone of the skull and can play an important role in sex determination. (7)) The presence of a dense layer of dense bone makes it extremely durable and therefore better preserved than many other bones. The mandible is the last bone to stop growing and is therefore vulnerable to rapid growth in adolescence. Therefore, most distinctive features are only recognized in adulthood.(7)(8) It is sensitive during young development and exhibits many dimorphic features that can be used for sexual assessment.(9)(10) Mandibular dimorphism is known to be influenced by the relative development (size, strength, and angulation) of the mastication muscles because males and females exert

different masticatory forces. The mandibular condyle and ramus, in particular, are typically the most sexually dimorphic locations that are associated with the greatest morphological changes in size and remodelling during growth. Measurements of the mandibular ramus typically reveal more gender differences than those of the mandibular body, and measurements of the mandibular ramus typically reveal more sexual dimorphism. Measurement and morphometry-based methods are reliable and can be used to determine sex. Weidenreich evaluated sexual dimorphism in the mandible and reported that the female female on average accounted for 92.4% of the male size.(7)(10,11) The accuracy of sex determination is reported to be 80.2–92% in adults.(12) This bone is usually preserved intact or in fragments excavated from archaeological sites. The relative development of masticatory muscles is known to influence the expression of mandibular dimorphism because the masticatory forces exerted in males and females are different.(5)(13) The minimum ramus width is the shortest anterior - posterior diameter of the ramus. The aim of the present study is to determine sex of the individuals using mandibular ramus width (right side).

MATERIALS AND METHODS
Study setting
The study was conducted in the department of Forensic Odontology, Saveetha Dental College and Hospitals.

Sample collection
The samples were collected from the archives of the department of Oral Medicine and Radiology unit Saveetha Dental College and Hospitals, Chennai. A retrospective study was conducted using an orthopantomograph of 60 subjects (30 males and 30 females).

Inclusion criteria
The ages ranged from 41 to 50 years. Ideal orthopantomographs were selected for the study. These samples were segregated according to their date of birth and date of radiograph taken.

Exclusion criteria
Pathological, fractured, deformed and developmental disturbances of the mandible were excluded from the study.

Statistical analysis
At the time of analysis each radiograph was assigned a code that did mask the patient's sex to avoid bias. Subsequently these radiographs were viewed in Planmeca Rome IX viewer software 2.9.2.R. Since the radiographs used in this investigation have been stored in the system, ethical approval was not needed.
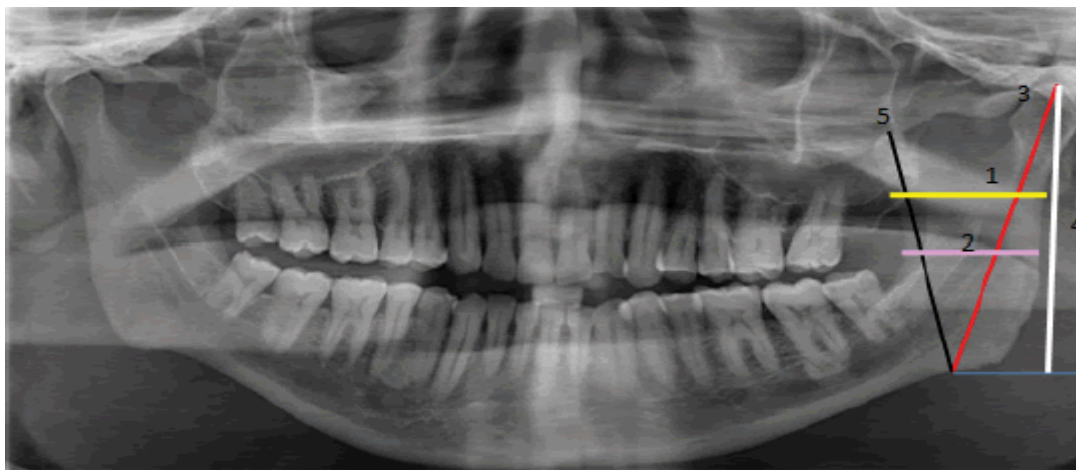

Figure 1: Digital orthopantomograph showing mandibular ramus measurements *

RESULTS

Table 1: Represents the descriptive statistics of the width of ramus of mandible in male and female with the values of maximum, minimum, mean and standard deviation.   In the present study comprising 30 males and 30 females; The mean $\pm$ standard deviation for male is 35.9667 $\pm$ 4.02264 and the mean $\pm$ standard deviation for female is 36.7567 $\pm$ 4.90487.

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Male	30	28.00	44.30	35.9667	4.02264
Female	30	29.10	53.30	36.7567	4.90487
Valid N (listwise)	30				
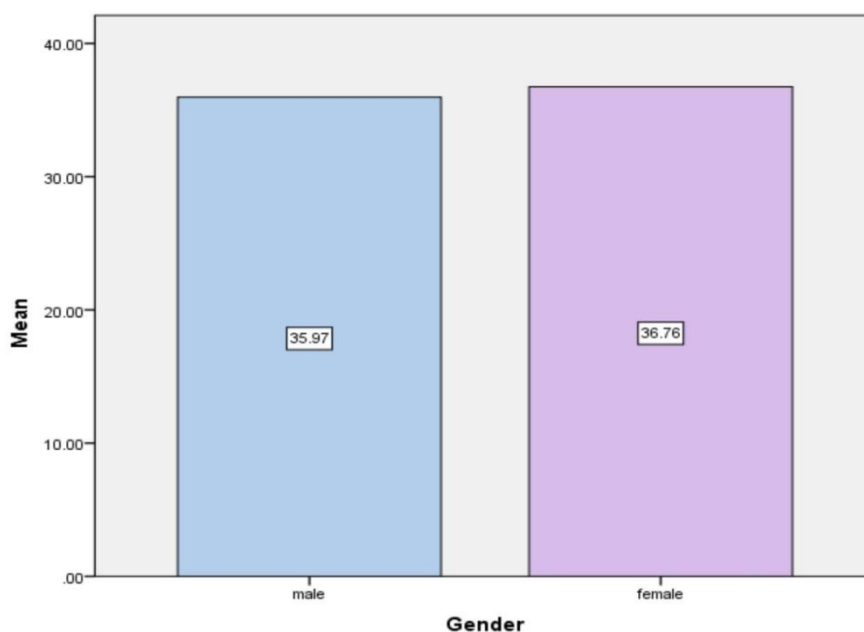
Graph 1: Represents the graph between gender and mean value of the width of mandibular ramus. X axis- Gender; Y axis- Mean width of mandibular ramus. Blue colour denotes Male and purple colour denotes female. The graph shows that the minimum mandibular ramus width of females is 36.76 and that of male is 35.97.

DISCUSSION

Mandible was chosen for analysis since it was still intact when it was retrieved.(14) Mandibles exhibit dimorphism in terms of their size and shape, and are often bigger and stronger in men than in females. Its obvious dimorphism is caused by its sensitivity to the teenage growth spurt and the mandible's last stop of growth. According to Humphrey, et al., (15) the condyle and ramus area underwent remodelling to a greater extent and were therefore taken into account in the current investigation. Males and females develop their mandibles at various rates, stages, and lengths, which makes them effective for sex discrimination.(16)(5)

In the present study, standardised orthopantamographs (opg) with mandibular ramus width measurements were subjected to analysis. The minimum mandibular ramus width for females was greater, stating that the mandible is the best parameter for sex determination. This was in unison with previous works of Maloth et. al., Nagaraj et. al., Byahatti et. al., Karmarkar et. al. (17)(18–20)

The present study shows greater minimum ramus width in females , this result was in unisom with previous studies.   The previous studies of Abuakhija et.al., (21) showed that the mean value of minimum ramus width in males and females was 29.4225 and 29.5525, respectively, stating that mandibular ramus is the better parameter in sex determination. The previous works of A. Ponnusamy *et(5)* stated that minimum ramus breadth was found to be the best parameter, because the breadth measurements were found to be very dimorphic.

The present study shows that the minimum mandibular ramus width of females is greater than that of male and hence it is the best parameter in sex determination. This result was not in unity with the previous works of Saini et. al., (7)which stated that the coronoid height was a better parameter than minimum mandibular ramus width in determination of sex.

As a pilot study, there are fewer samples included in this analysis. Future study can be conducted by enlarging the sample size and contrasting other sex-relevant characteristics. It can also be accomplished by taking various racial groups into account.

CONCLUSION

The ability to resist injury and disintegration processes makes the mandibular ramus a useful tool for determining gender. We discovered that orthopantomograph measures of the mandibular ramus width were accurate at predicting gender. The value of minimum mandibular ramus width of females is greater than males. From the results it can be concluded that minimum mandibular ramus width is one of the best parameters in sex determination. Therefore, we strongly advise using the mandibular ramus width as a tool for forensic examination to help determine gender.

Author Contributions

Noor Fathima. J : Literature search, experimental data collection, analysis, manuscript writing Dr. Dr. Abirami Arthanari : Study design, data verification, manuscript drafting

CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest in the present study

REFERENCES

1. Shaaban A, El-Shall O. Study of Age and Gender Related Variations in Position of Mental Foramen of Some Egyptians Using Digital Panoramic Radiography [Internet]. Vol. 29, Ain Shams Journal of Forensic Medicine and Clinical Toxicology. 2017. p. 36–47. Available from: http://dx.doi.org/10.21608/ajfm.2017.18208
2. Naikmasur VG, Shrivastava R, Mutalik S. Determination of sex in South Indians and immigrant Tibetans from cephalometric analysis and discriminant functions. Forensic Sci Int. 2010 Apr 15;197(1-3):122.e1–6.
3. Özer İ, Katayama K. Sex determination using the femur in an ancient Anatolian population [Internet]. Vol. 64, Anthropologischer Anzeiger. 2006. p. 389–98. Available from: http://dx.doi.org/10.1127/anthranz/64/2006/389
4. Franklin D, O'Higgins P, Oxnard CE, Dadour I. Discriminant function sexing of the mandible of indigenous South Africans. Forensic Sci Int. 2008 Jul 18;179(1):84.e1–5.
5. Indira AP, Markande A, David MP. Mandibular ramus: An indicator for sex determination - A digital radiographic study. J Forensic Dent Sci. 2012 Jul;4(2):58–62.
6. Upadhyay RB, Upadhyay J, Agrawal P, Rao NN. Analysis of gonial angle in relation to age, gender, and dentition status by radiological and anthropometric methods. J Forensic Dent Sci. 2012 Jan;4(1):29–33.
7. Saini V, Srivastava R, Rai RK, Shamal SN, Singh TB, Tripathi SK. Mandibular Ramus: An Indicator for Sex in Fragmentary Mandible* [Internet]. Vol. 56, Journal of Forensic Sciences. 2011. p. S13–6. Available from: http://dx.doi.org/10.1111/j.1556-4029.2010.01599.x
8. Behl A, Grewal S, Bajaj K, Baweja P, Kaur G, Kataria P. Mandibular ramus and gonial angle ─ Identification tool in age estimation and sex determination: A digital panoramic radiographic study in north indian population [Internet]. Vol. 32, Journal of Indian Academy of Oral Medicine and Radiology. 2020. p. 31. Available from: http://dx.doi.org/10.4103/jiaomr.jiaomr_172_19
9. Dong H, Deng M, Wang W, Zhang J, Mu J, Zhu G. Sexual dimorphism of the mandible in a contemporary Chinese Han population. Forensic Sci Int. 2015 Oct;255:9–15.

10. Ranaweera WGPE, Ranaweera WGP, Chandrasekara CMCT, Hraputhanthii HDS, De Silva P, Herath LHMI. Sex determination by mandibular ramus – a digital panoramic study [Internet]. Vol. 11, Sri Lanka Journal of Forensic Medicine, Science & Law. 2020. p. 10. Available from: http://dx.doi.org/10.4038/sljfmsl.v11i1.7833

11. Kaur R, Pallagatti S, Aggarwal A, Mittal P, MandeepSingh, Patel M. Mandibular ramus as a strong expressor of sex determinations: A digital radiographic study [Internet]. Vol. 13, Journal of Pharmacy And Bioallied Sciences. 2021. p. 421. Available from: http://dx.doi.org/10.4103/jpbs.jpbs_574_20

12. Akhlaghi M, Khalighi Z, Vasigh S, Yousefinejad V. Sex determination using mandibular anthropometric parameters in subadult Iranian samples. J Forensic Leg Med. 2014 Feb;22:150–3.

13. Chaurasia A, Professor A, Department of Oral Medicine & Radiology, Faculty of Dental Sciences, King Georgeâ€TMs Medical Unniversity Lucknow., Katheriya G, et al. Mandibular Ramus as Dimorphic Tool in Age and Sex Determination-A Cross Sectional Radio-Anthropometric Study on Digital Panoramic Radiograph [Internet]. Vol. 10, Indian Journal of Dental Education. 2017. p. 30–8. Available from: http://dx.doi.org/10.21088/ijde.0974.6099.10217.6

14. Memarian A, Aghakhani K, Mehrpisheh S, Fares F. Gender determination from diagnostic factors on anteroposterior pelvic radiographs. J Chin Med Assoc. 2017 Mar;80(3):161–8.

15. Humphrey LT, Dean MC, Stringer CB. Morphological variation in great ape and modern human mandibles [Internet]. Vol. 195, Journal of Anatomy. 1999. p. 491–513. Available from: http://dx.doi.org/10.1046/j.1469-7580.1999.19540491.x

16. Shakya T, Maharjan A, Pradhan L. Morphometric Analysis of Mandibular Ramus for Sex Determination on Orthopantomogram. J Nepal Health Res Counc. 2022 Jun 2;20(1):65–71.

17. Maloth K, Kundoor VR, Vishnumolakala SSP, Kesidi S, Lakshmi M, Thakur M. Mandibular ramus: A predictor for sex determination - A digital radiographic study [Internet]. Vol. 29, Journal of Indian Academy of Oral Medicine and Radiology. 2017. p. 242. Available from: http://dx.doi.org/10.4103/jiaomr.jiaomr_170_16

18. Nagaraj T, James L, Gogula S, Ghouse N, Nigam H, Sumana CK. Sex determination by using mandibular ramus: A digital radiographic study [Internet]. Vol. 4, Journal of Medicine, Radiology, Pathology and Surgery. 2017. p. 5–8. Available from: http://dx.doi.org/10.15713/ins.jmrps.99

19. Byahatti S, Samatha K, Ammanagi R, Tantradi P, Sarang C, Shivpuje P. Sex determination by mandibular ramus: A digital orthopantomographic study [Internet]. Vol. 8, Journal of Forensic Dental Sciences. 2016. p. 95. Available from: http://dx.doi.org/10.4103/0975-1475.186367

20. Karmarkar PH, Mhapuskar A, Prasad Hiremutt DR, Kale IP, Sane RV, Tepan M. Mandibular ramus: An indicator for gender determination [Internet]. International journal of health sciences. 2022. p. 5385–93. Available from: http://dx.doi.org/10.53730/ijhs.v6ns4.10757

21. Abualhija D, Revie G, Manica S. Mandibular ramus as a sex predictor in adult Jordanian Subjects [Internet]. Vol. 21, Forensic Imaging. 2020. p. 200366. Available from: http://dx.doi.org/10.1016/j.fri.2020.200366