

## Radiometric Evaluation of Mandibular Ramus for Gender Determination

Anju Sharma<sup>1</sup>, Kusum Singal<sup>1</sup>, Permila Singh<sup>1</sup>, Neel Kamal Sharma<sup>1\*</sup>

<sup>1</sup>Department of of Genetics, Maharshi Dayan and University, Rohtak, India.

\*Corresponding author: Dr. Neelkamal Sharma, Department of Genetics, Maharshi Dayan and University, Rohtak, India, Tel: (+91) 81-75-563-4121; E-mail:sharmaneel@gmail.com

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### Abstract

Mandible (Lower jaw bone) plays an important role in identification of unknown. Radiometric evaluation of mandibular bone can be used as a gender indicator. Aim: The aim of the study was to determine the gender of any unknown skeletal remain with the help of mandibular bone. The study was conducted with the help of 147 panoramic radiographs collected from the Department of Oral Medicine and Radiology, PGIDS. The digital OPG were subjected to radiometric analysis of mandible using imaging software ADOBE Photoshop, version CS6. The parameters used for the sex determination are given condylar height, coronoid height, bicondylar distance, maximum ramus height, minimum ramus height, mandibular body height, mandibular body length, gonial angle. In the present study, amongst all the assessed parameters bicondylar distance showed the highest degree of sexual dimorphism followed by coronoid height and condylar height. Conclusion: Mandibular bone can be used as a guide in determining the sex of an individual or any unknown dead body.

**Keywords:** Mandible; radiometric; OPG; Gender Determination; Ramus

### Introduction

Anthropology is the scientific study that deals with the origins and dead remains of human beings, and how their morphological characteristics changed over the years, and how they relate with each other, both those belong to our own culture and those who belong from other culture. Gender determination of unknown is of great significance in the field of anthropology and forensic science [1,2]. Morphological and metric features of the skull and the mandible, soft tissues, dental records as well as from DNA analysis of teeth and bones are the parameters that can be used for determining sex of unknown. Sex assurance from skeletal remains is most critical in the distinguishing proof of human remains as it halves the number of possible matches [3].

Gender determination poses certain difficulties and is based on the remains of skeletal structures and teeth of an individual. But If the whole grown-up skeleton is accessible for examination then the sex of any individual can be resolved up to 100%

exactness, however in the event that where bodies are harmed to the point of being indistinguishable as in mass catastrophs, impacts, battling, blasts, air storms from rotted and harmed dead bodies then it depends to a great extent on divided and accessible parts of skeleton [4]. What's more, it turns out to be more troublesome because of debased or deficient evidences.

Skull is the most dimorphic and suitable structure after pelvis for sex determination of any dead body. From skull, mandible is the most reliable bone for sexual dimorphism. When identifying the sex of a skull, a single characteristic is not used, lots of factors are considered and used together to determine the sex of the human remains [5].

The mandible, lower jaw or jawbone is the largest, strongest and lowest bone in the human face. And it persists in a well-preserved state longer than any other bones. The body of the mandible is bended, fairly like a horseshoe. Mandible is considered the most dimorphic bone that plays an important role in sex determination. Mandible assumes an imperative part in sex assurance as it is viewed as most sturdy, biggest, most grounded bone of skull with various maturational patterns exist in males and females during growth and development [6]. Sexual dimorphism in the mandible might be because of the relative contrast in the advancement of the musculoskeletal framework, particularly the muscles of mastication appended to the mandible. Mandibular ramus can be differentiated between sexes, based on the different stages of mandibular development, growth rates, shape and size. Due to the distinctive masticatory powers applied by males and females, the size and state of the mandible fluctuates where males have greater and more robust mandible than females [7]. The present study was conducted in Haryana population using 147 orthopantomograms (OPG) obtained from 147 individuals with the aim of gender determination [8].

### METHODOLOGY

The study was conducted with the help of 147 panoramic radiographs collected from the Department of Oral Medicine and Radiology, Post Graduate Institute of Dental Sciences (PGIDS) (Table 1). The digital OPG were subjected to radiometric analysis of mandible using imaging software ADOBE Photoshop, version CS6. The parameters used for sex determination are given below [9].

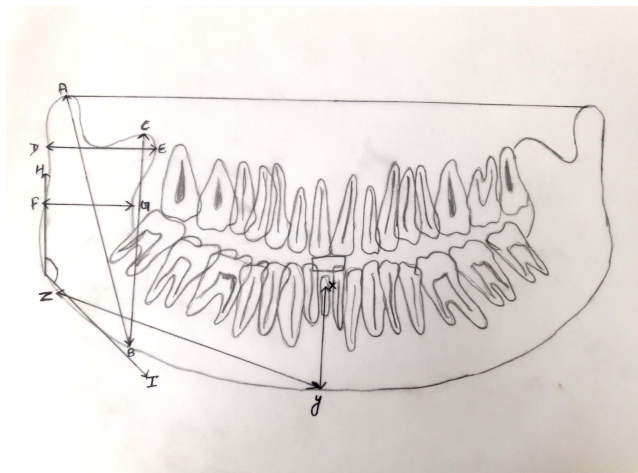
Age	Male	Percentage	Female	Percentage
17-26	11	7.482	38	25.85
27-36	18	12.24	21	14.28
37-46	6	4.081	6	4.081
47-56	24	16.32	17	11.56
57-66	4	2.721	-	-

## Maximum Ramus Breadth (Max. RB)

The separation between the most front point on the mandibular ramus and a line interfacing the most back point on the condyle and the edge of jaw.

## Gonial Angle (GA)

A mandibular line was drawn tangential to the two lowest points on the anterior and posterior borders of the mandible and a ramus line was drawn tangential to the posterior border of the ramus and the condyle [10]. The intersection of these two lines formed the gonial angle. (Figure 1).



**Figure 1:** Showing parameters considered in the present study. (A-B: CoH, B-C: CH, D-E: Maxi. RB, F-G: Min. RB, X-Y: MBH, Y-Z: MBL, FI: Gonial angle, A-O: BB).

## RESULTS

All the data was compiled and analyzed on Microsoft excel 2007. Paired t-test and unpaired t-tests was used for comparative analysis of each parameter.

## Discussion

Identification of sex plays a noteworthy part in forensic medicine and anthropology particularly in instances of blasts, fighting, and recognizable proof of missing individuals and with a specific end goal to remake the old lives.

Gender, age and stature are the form the primary data for biological identity of an individua. Morphological attributes of jaw bone is utilized for sex assurance because mostly this bone can be recovered intact in any condition. Morphometric analysis

of mandible is found to be one of the most accurate methods for gender determination. Mandible is the strongest structure of skull due to thick compact outer layer. Dimorphism in mandible is because of size and shape and male bones are normally substantial and solid than female bones [11].

Orthopantomograph is broadly and routinely utilized by clinicians for determination of oral ailments. Panoramic picture is valuable in light of its wide scope, low patient radiation measurements, brief time required for picture procurement and superimposed pictures are not experienced and very good source for retrospective studies [12-16]. The differentiation and brilliance upgrade quality make panoramic radiographs most suitable for the present study.

## CONCLUSION

Sex determination is of extraordinary significance in anthropological and medicolegal perspectives [17]. The mandibular bone can be utilized as a significant device in sex assurance since it has protection from harm and crumbling forms in any conditions. The present study demonstrated that the mandibular radiometric analysis assumes a vital part in sex assurance because of its exceptional high sexual dimorphism and remarkable structure[18].

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