

Gender Determination Using Mental Foramen In East Godavari District Population of Andhra Pradesh – A Panoramic Study

¹Koduri Sridevi, Professor and Head, Department of Oral Medicine and Radiology, Lenora Institute of Dental Sciences, Rajahmundry, Andhra Pradesh.

²T.Murali Mohan, Professor and Head, Department of Conservative Dentistry and Endodontics, Govt. Dental College, Vijayawada, Andhra Pradesh.

³B.Krishnaveni, Reader, Department of Oral Medicine and Radiology, Lenora Institute of Dental Sciences, Rajahmundry, Andhra Pradesh.

⁴B H David Leninson, Senior Lecturer, Department of Oral Medicine & Radiology, Lenora Institute of Dental Sciences, Rajahmundry, Andhra Pradesh, India

⁵A D N Deepika, Reader, Department of Oral Medicine and Radiology, GSL Dental College, Rajahmundry, Andhra Pradesh.

⁶Ankitha Masa, Postgraduate Student, Department of Oral Medicine and Radiology, Lenora Institute of Dental Sciences, Rajahmundry, Andhra Pradesh.

Corresponding Author: Koduri Sridevi, Professor and Head, Department of Oral Medicine and Radiology, Lenora Institute of Dental Sciences, Rajahmundry, Andhra Pradesh.

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Abstract

Aim: To determine the gender using mental foramen as landmark on a panoramic radiographs in selected East Godavari District population of Andhra Pradesh.

Materials and Method: 200 Panoramic radiographs were selected for the analysis of mental foramen. Tangents were drawn through the superior and inferior borders of the foramen (S-L and I-L respectively) to lower border of the mandible bilaterally. Digital measurement by the AGFA software, was used for the distance measurement from S-L and I-L. The data

obtained was tabulated and subjected to statistical analysis.

Result: The analyzed data of study showed that the mean values of S-L and I-L were significantly higher in males as compared to females.

Conclusion: The results of the present study concluded a definite sexual dimorphism in the position of the mental foramen from the base of the mandible. This method can be applied in mass disaster where the fragments of mandible are available.

Keywords: Gender determination, Mandible, Mental foramen, Sexual dimorphism,

Introduction

With increasing incidence of violence, accidents and mass disasters identification of mortal remains becomes very important. It is further compounded by the fact that only fragmentary remains are usually available. Bones are an important tool in establishing the identity of an individual and they also help in establishing the process of evolution, race and demographic profile. Sex determination is most important because it reduces the possible matches by half and also, the other parameters i.e. age and stature is highly sex dependent. The accuracy of sex determination directly depends on the availability of the complete skeleton. It is 100% with a complete skeleton, 95% with pelvis and 90% with skull. Mandible is the most durable and sexually dimorphic bone of the skull and resists post mortem changes.^[1]

Gender determination of males from females and the differences in ethnic groups by analyzing the morphological characteristics of bone is important in the fields of physical and forensic anthropology. Many anatomical landmarks like frontal bone, orbital bone, maxillary sinus, tooth and jaws in human skull can be used in forensic science for individual identification or for determination. The mandible is the strongest bone in the human body and persists in a well-preserved state longer than any other bone.^[2] Therefore, the use of morphological features of the mandible is a common approach used by anthropologists and forensic dentists in the determination of sex.^[3]

Few of the morphological characteristics of mandible that shows sexual dimorphism are: a) Angle of the mandible which is more prominent in males when compared to females, b) Inter canine distance which is more in males, c) Symphysis menti which is squarish and/or lobulated in males.^[4] The mental foramen is a funnel like opening which is located 11- 15 mm superior to the inferior

border of mandible transmitting mental nerves and vessels which supplies sensory innervations to lower lip, buccal vestibule and gingival mesial to first mandibular molar. As wall of foramen is made up of cortical bone, so when bone density increases mental foramen becomes difficult to identify on radiographs. Mental foramen aids in interpreting anatomical landmarks in oral pathology and forensics as among many anatomical landmarks in human skull, mental foramen is a stable landmark on mandible.^[5]

The radiographs are indispensable tools that are used in forensic anthropology. The radiographic method is simplest and cheapest method for age estimation and gender determination when compared to the histological and biochemical methods. Among radiographic methods Panoramic radiography is the most preferred diagnostic modality as it allows a more accurate localization of mental foramen. The present study was conducted with the aim to determine the gender using mental foramen as landmark on a panoramic radiographs in selected East Godavari District population of Andhra Pradesh.

Materials and Methods

The present study was carried out in the Department of Oral Medicine and Radiology, Lenora Institute of Dental Sciences, Rajanagaram, East Godavari (District). The study sample was consisting of 200 OPGs (100 Male and 100 Female) of high clarity with well visualization of mental foramen and clear borders of mandible belonging to all dentulous patients within the age group of 18 to 55 years. The distorted images, presence of any artifacts, patients under went any surgical procedures related to mandible and patients with any pathology related to mandible were excluded from the study. The OPGs showing the mental foramen overlapping on to the roots of the premolars were also excluded.

Methodology

Total 200 digital OPGs were selected for the study and were divided into two groups: group I (Male) and group II (Female). In each group 100 OPGs were selected and the selected OPGs were analysed for mental foramen as a well defined radiolucency near the mandibular premolar region. Then two tangents were drawn and measured through the superior and inferior borders of the foramen (S-L and I-L respectively) to lower border of the mandible bilaterally. All the radiographs were taken using the PLANMECA 2002 EC PROLINE machine with tube potential 70 KV, tube current 12 mA, total filtration 2.5 mm, focal spot 0.5, and time 18 sec. Digital measurement was marked by the AGFA software to measure the distance from S-L and I-L.

Statistical Analysis

“t” test was performed to determine the level of significance between the male and female population groups.

Results

The mean distance of S-L observed in males was 17.8mm and 17.6mm on the right and left sides respectively, whereas in females it was 15.00mm. The comparison of S-L between males and females showed a very high significant difference on both the right ($p = 0.000$) and the left sides ($p = 0.001$).

The mean distance of I-L in males was 15.00mm and in female it was 12.13mm on the right side. The mean distance of I-L in male was 14.80mm and in female was 12.22mm on the left side (Table/ Figure 1 & 2). A very high significant difference was observed between the two population groups. The mean distance of S-L and the mean distance of I-L both were much longer in male group when compared with female group.

Comparison of S-L ($P = 0.66$) and I-L ($P = 0.93$) between the right and the left sides in males described a non-

significant difference. Comparison of S-L ($P = 0.87$), I-L ($P = 0.87$) between the right and left sides in females also showed a non-significant difference. Thus there was no significant difference was found between the right and the left sides in both male and female groups. [Table/Figure – 3 & 4]

Discussion

Distinguishing males from females and the differences in ethnic groups by analyzing the morphological characteristics of bone is important in the fields of physical and forensic anthropology. The mandible is the strongest bone in the human body and persists in a well-preserved state longer than any other bone.^[6] Therefore, the use of morphological features of the mandible is a common approach used by anthropologists and forensic odontologist in the determination of sex.^[7]

Panoramic radiography is a curved plane tomographic radiography used to depict the body of the mandible, maxilla and the lower one-half of the maxillary sinuses on a single image. The ability to view the entire body of the mandible allows a more accurate location of the mental foramen in both a horizontal and a vertical dimension on OPG.^[8]

Lindh et al. in 1995 and Guler et al. in 2005 also suggested that the stability of this region does not depend on resorption of alveolar process above the foramen. Therefore, the vertical measurements in panoramic radiography are clinically applicable for the quantification of height of alveolar bone in this region.^[9,10] Because of the stability of the basal bone and mental foramen, these landmarks were selected as a point of reference for the present study.

On the contrary, Vodanovic et al. found that the mean value of I-L does not exhibit sexual dimorphism.^[11] The difference may be due to racial diversity of the study population. In our study, this value was also significantly

high in males, which also corresponds to the studies of Enlow et al. and Amorim et al.^[12]

The present study also showed that the mean values of comparison of S-L as well as I-L in males and females were significantly higher in males as compared to females. The study showed the comparison of SL and IL on right and left side in the same patient was without any significant difference. ($p>0.05$). This suggests that the technique can be applied for sex determination of individual, even if half the mandible or part of mandible with mental foramen and intact lower border of mandible is available for identification.

In the present study, the 95% confidence interval range analysis described that the S-L in males comes within the range of 17.6 to 17.8mm, and in females it fall within the range of 14.8 to 15.00 mm. The I-L in males ranges between 14.8mm and 15.00 mm and in females it comes within the range of 12.22 and 12.30 mm.

These results suggest that if a distance above 17.6 mm for S-L and 14.8 mm for I-L is obtained on the panoramic radiograph; the gender will be male in 95% of the cases. if a distance less than 14.8 mm for S-L and 12.22 mm for I-L is obtained, the gender will be female in 95% of the cases.

Table 1: Showing the mean distance of S-L and I-L in male and female groups in the right and the left sides.

Side		Mean (SD) (mm)	Mean(SD)(mm)	P value
		Male group	Female group	
S-L	Right	17.8 ± 0.22mm	15.00 ± 0.15mm	0.0001
	Left	17.6 ± 0.22mm	14.80 ± 0.16mm	0.0001
I-L	Right	15.00mm	12.30mm	P=0.000
	Left	14.80mm	12.22mm	P=0.000

Figure 1: Showing OPG with highlighted mental foramen

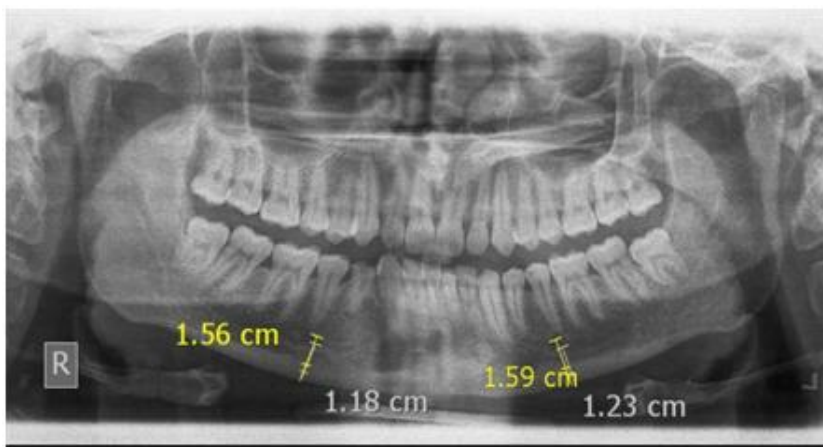
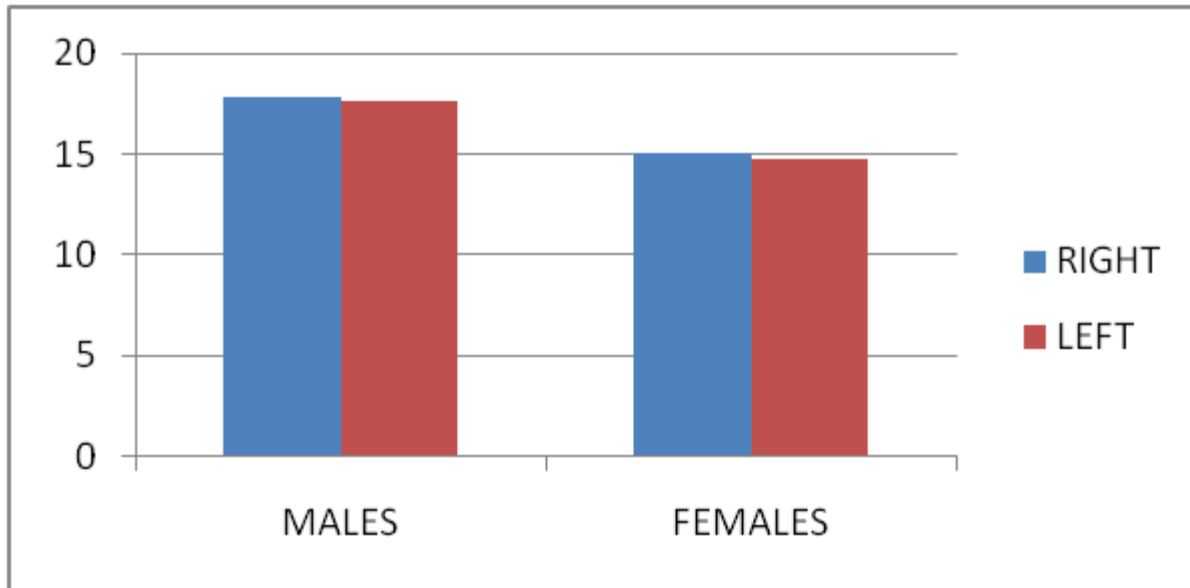


Table 2: Showing the difference between male and female groups on the right and the left sides.

Parameters	Males (P Value)	Females (P Value)
S-L	0.66	0.87
I-L	0.93	0.87

Figure 2: Bar diagram showing the difference between male and female groups on the right and the left sides.



Conclusion

The results of present study concluded a definite sexual dimorphism in the position of the mental foramen from the base of the mandible; this method can be applied in mass disaster where the fragments of mandible are available.

References

1. AnujaKakade, Deepa Das, BhagyashreePurandare. Gender and age determination by radiographic analysis of the position of mental foramen in Navi Mumbai population. International journal of forensic odontology. 2022; 7(2): 9-19.
2. Masad A, Ghadia A, Eman AA, Ahmed AA, Abdullah Md. Mental foramen as an indicator of patient's gender, panoramic study in Qassim province, Saudi Arabia. J Dent Health Oral DisordTher. 2022;13(3):69-72.
3. Matamala DAZ, Galdames ICS, Smith RL, Sexual Dimorphism Determination from the Lineal Dimensions of Skulls, International journal of Morphology. 2009; 27 (1): 133-137.
4. Priyasahni, Ronak j. Patel, Shylaja, Jaydevah. M, Anil patel. Gender determination by pantomographic (opg) analysis of Mental foramen in north gujarat population- a retrospective study. Med. Res. Chron., 2015, 2 (5), 701-706
5. Mamta Malik, SanjeevLaller, Ravinder S Saini, Rakesh Kumar Mishra, InduHora, NishaDahiya. Mental foramen: An Indicator for Gender Determination - A Radiographic Study. Santosh University Journal of Health Sciences 2016; 2(1): 12-14.
6. Sweet D. Why a dentist for identification? Dent Clin North Am. 2001;15:237-51.
7. Steyn M, Iscan MY. Sexual dimorphism in the crania and mandibles of South African whites. Forensic Sci Int. 1998;98:9-16.
8. Chandra A, Singh A, Badni M, JaiswalvR, Agnihotri A, Determination of sex by radiographic analysis of mental foramen in North Indian population, Journal of forensic dental sciences. 2013; 5 (1): 52-55.
9. Lindh C, Peterson A, Klinge B. Measurements of distance related to the mandibular canal in radiographs. Clin Oral Implant Res. 1995;6:96-103.
10. Guler AU, Sumer M, Sumer P, Bicer I. The evaluation of vertical heights of maxillary and mandibular bones and the location of anatomic

landmarks in panoramic radiographs of edentulous patients for implant dentistry. *J Oral Rehabil.* 2005;32:741–746.

11. Anvi P, Nilesh R, Neeldip J, Avani S, Dolly B, Dolly K. Gender determination by analysis of mental foramen using CBCT: A retrospective study. *J PharmaNeg Res.* 2022;40(8):3172–82.
12. AymenHameed, hulficar G, Firas S, Haider AH. Identification of gender by radiographic analysis of mental foramen in a sample of Iraqi patients. *Bang J Med Sci.* 2022;27(1):79–83.