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PREDICTION OF GENDER BY ANALYSIS OF MENTAL FORAMEN USING PANORAMIC RADIOGRAPHS -A RETROSPECTIVE STUDY.

Dental Science

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ABSTRACT

BACKGROUND-Previously human skull, pelvis and antemortem evidences were used in forensics to determine human identity and gender but with advancement of dental science jaw bones especially mandible which is stable landmark used in gender determination and such skeleton metric analysis done on radiographs are found to be of more accuracy. **AIM**-To assess the usefulness of mental foramen as an aid in gender determination.**SETTING AND DESIGN**-Study was conducted in Buddha Institute of Dental Sciences and Hospital, Postgraduate Institute and Research Center Patna,Bihar. **MATERIAL AND METHODS**- Study sample included Two hundred panoramic radiographs (100 males and 100 females) for mental foramen analysis of selected bihar population. Distance from superior and inferior borders of mental foramen to the lower border of mandible (SL and IL) of both sides were recorded by drawing tangents to the superior and inferior borders of mental foramen and perpendicular to the lower border of mandible from tangents .The data obtained were subjected to statistical analysis. Statistical analysis was carried out using t-test and Chi-square test that included the mean values in males and females of both the right and left sides . **RESULTS-**The obtained average values of SL and IL were found significantly higher in males than in females ,But the distances of SL and IL for the right and left sides individually for both males and females of a study sample were almost similar and results were non-significant. **CONCLUSION**-Within the limitations of the present study, analyzing mental foramen on panoramic radiographs can be convenient and cost effective option .

KEYWORDS

gender determination, mental foramen , panoramic radiograph.

INTRODUCTION

Identification of person using morphometric parameters of dental structures is very important in forensic sciences. When only skull remnants are remaining, the identification of person becomes difficult, and in such cases, mandibular structures play a vital role. [1]

Mandible is the hardest and most durable bone of the skull, exhibiting a high degree of sexual dimorphism .Studies have shown differences between gender in the height of mandible and position of mental foramen (MF).[2]

The radiographs are indispensable tools that also aid in forensic investigations. The utilization of radiographs for identification is valuable if sufficient antemortem records are available.

Radiographically, MF appears as either round, oblong, slit-like or very irregular radiolucent area which is partially or completely corticated. MF is located in the body of mandible midway between the inferior and alveolar margins. [4]

Panoramic radiographs (orthopantomogram [OPG]) show bilateral location MF, mandibular foramen, ramus, angle, and body of the mandible. OPG allows more accurate location of the MF in both horizontal and vertical dimensions . [5]

Data available for gender determination based on location MF in relation to lower border of mandible (LBM) using radiographs are sparse. In this background, the present study was designed to evaluate the differences in measurements from superior border of MF (SL) and inferior border of MF (IL) to the LBM and using OPG. [6]

MATERIAL AND METHODS-

Source Of Data-

The present study was designed to be conducted on patient on panoramic radiograph in Oral Medicine And Radiology, Department Of Buddha Institute Of Dental Sciences And Hospital , Patna Bihar. The study comprised of 200 subjects of which (100) were males and (100)females belonging to the age group of 18-55 years. All OPG was captured by VA tech pax-400c x-ray imaging system with90 kv -10 milliampere and data recorded in a predetermined format and ethical clearance was taken for the study.

In the selected OPG mental foramen was identified clearly and marked .The tangents were drawn through the superior and inferior border of foramen and perpendicular lines were drawn from tangents to the lower border of mandible.

Digital Vernier caliper was used to measure the distance from superior border of mental foramen to lower border of mandible(S-L)and inferior border of mental foramen to lower border of mandible(I-L) bilaterally .Data obtained was tabulated and subjected to statistical analysis.

INCLUSION CRITERIA-

1) Patients aged between 18 -55 years equal number of males and females(100 males and 100 females)
2) Only high quality radiographs with clearly mental foramen and border of mandible included in this study.

EXCLUSION CRITERIA-:

1) Distortion of images ,presence of artifacts, surgical interventions , presence of any pathology .
2) Patients with missing lower molars and premolars.
3) Diffuse, unidentified mental foramen appearance on the radiographs.

STUDY DESIGN

The study was a randomized controlled trial patients were divided into 2 groups randomly of (100) male subjects and (100)female subjects.

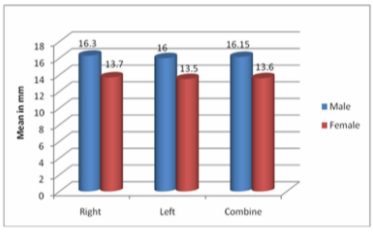
RESULT

STATISTICAL ANALYSIS

The measurements were tabulated on an excel sheet and analyzed for mean value in males and females on both the right and left sides. Statistical calculations were performed Mean values were calculated and unpaired t-test was applied to see the significant differences; $P < 0.05$ was considered statistically significant.

Table-1 Comparison Of Right And Left S-I In Males And Females

	Male (n=100)		Female (n=100)		
	Mean (SD) Mm	CI 95% Mm	Mean (SD) Mm	CI 95% Mm	P-value
Left	16 (1.42)	15.76-16.36	13.5 (1.51)	13.30-13.88	0.001
	Mean (SD) Mm	CI 95% Mm	Mean (SD) Mm	CI 95% Mm	P-value
Right	16.3 (1.39)	16.04-16.61	13.7 (1.46)	13.41-13.99	0.001

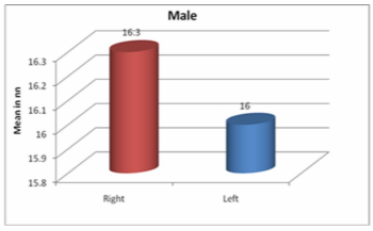


GRAPH-1 COMPARISON OF [SL] BETWEEN MALES AND FEMALE

[Table1], Graph1 mean distance of SL on right side in males was 16.3 mm, whereas it was 13.7 mm in females. On the left side, it was 16 mm in males and 13.5 mm in females. The comparison of S-L between males and females showed a very high significant difference on both the right (p =0.001) and the left sides (p = 0.001).

Table-2 Comparison Of Right & Left S-l In Males

MALES	Right	Left	P-value
Mean (SD) Mm	16.3 (1.39)	16 (1.42)	0.082 (ns)
CI 95% Mm	16.04-16.61	15.76-16.36	

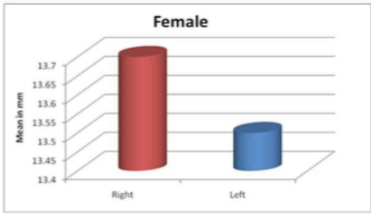


GRAPH-2 COMPARISON OF SL IN MALES IN RIGHT AND LEFT SIDE

[Table2] Graph2 SL Values in males on right side was 16.3mm and in left side it was 16mm with no significant difference

Table-3 Comparison Of Right And Left S-l In Females

Female (n=100)			
	Right	Left	P-value
Mean (SD) Mm	13.7 (1.46)	13.5 (1.51))	0.091(ns)
CI 95% Mm	13.41-13.99	13.30-13.88	

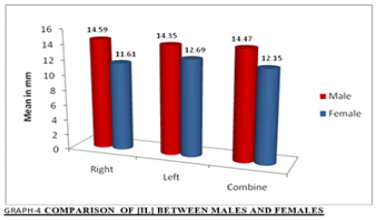


GRAPH-3 COMPARISON OF RIGHT AND LEFT S-L IN FEMALES

[Table-3].Graph-3 The distance from SL on the right side (13.7mm) in females was more than the left side (13.5 mm), with a no significant difference

Table-4 Comparison Of Right And Left [il] Between Males And Females

	Male (n=100)		Female (n=100)		
	Mean (SD) Mm	CI 95% Mm	Mean (SD) Mm	CI 95% Mm	P-value
Right	14.59 (1.79)	14.2-14.9	11.61 (1.67)	11.2-11.9	0.001
Left	14.35 (1.66)	14..2-14.6	12.12 (1.13)	11.8-12.6	0.001
Combine	14.47 (1.56)	14.1-14.7	12.15 (1.43)	11.9-12.4	0.001

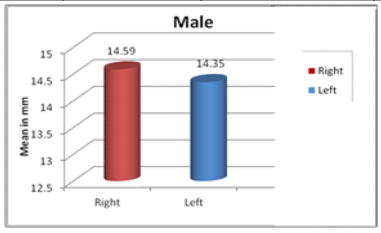


GRAPH-4 COMPARISON OF [IL] BETWEEN MALES AND FEMALES

[Table-4]Graph-4The mean distance of IL on right side in males was 14.59 mm, whereas it was 11.61 mm in females. On the left side, it was 14.35 mm in males and 12.12 mm in females. The comparison of I-L between males and females showed a very high significant difference on both the right (p =0.001) and the left sides (p = 0.001).

Table-5 Comparison Right & Left I-l In Males

Male			
	Right	Left	P-value
Mean (SD) Mm	14.59 (1.79)	14.35 (1.66)	0.072 (ns)
CI 95% Mm	14.2-14.9	14..2-14.6	

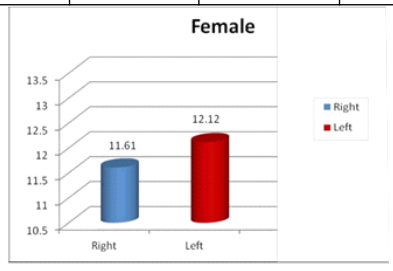


GRAPH-5 Comparison Right and left I-L in Males

[Table-5] Graph-5The distance from IL on the left side in males was slightly less (14.3) than the right side (14.5 mm), with no significant difference

Table-6 Comparison Right & Left I-l In Females

Female			
	Right	Left	P-value
Mean (SD) Mm	11.61 (1.67)	12.12 (1.13)	0.069 (ns)
CI 95% Mm	11.2-11.9	11.8-12.6	



GRAPH-6 COMPARISON RIGHT & LEFT I-L IN FEMALES

[Table 6]Graph-6.The distance from IL on the right side (11.6 mm) in females was less than the left side (12.1 mm), with a no significant difference

DISCUSSION-

Gender determination is an important aspect of forensic science and many studies are conducted regarding this. In this study mental foramen was considered for gender determination as forensic odontology play an important role in establishing gender with bodies mutilated beyond recognition due to major mass disasters.

Lower body of mandible was considered as a reference point in our study as distance from mental foramen to lower body of mandible remains constant throughout life. In 1974, Wical and Swoope described that despite the alveolar bone resorption above the mental foramen, the distance from the foramen to the inferior border of the mandible remains relatively constant throughout life[.4] 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. Because of the stability of the basal bone and mental foramen, these landmarks were selected as a point of reference for the present study. [5]

Panoramic radiograph was considered for our study as it is a curved tomographic technique used to depict the body of the mandible on a single image on both sides. The ability to view the entire body of mandible allows a more accurate location of the mental foramen in both the horizontal and vertical directions o panoramic radiograph. [6]

Present study two hundred subjects were selected for the analysis of mental foramen similar to study conducted by V.poongoodi and etal in year 2016 in which the subjects selected were two hundred. In our study SL value in males was 16mm which was coherent to study conducted by Akhilesh Chandra and etal in year 2013 in which SL

value was in the range of 16.9mm[.7] Chandra A et al, Sura A. Rashid conducted study in 2011 and found that the mean values of S-L and I-L to be significantly high in males as compared with females .Similarly the present study also showed that the mean values of S-L as well as I-L in were significantly higher in males as compared to females. Mamta Mallick et al carried out study in year 2016 and showed that value of SL and IL on both (right and left side) were almost similar which supported our study results.[8] The present study suffers from a number of limitations. Various newer radiographic techniques can be used to analyze and support our findings but considering the feasibility , non availability and cost effectiveness of newer radiographic techniques as CBCT Panoramic radiographs can be easy available and economical choice for this study. The small sample size of the study was another limiting factor for it.Thus, further studies need to be designed with larger sample size.

CONCLUSION-

The purpose of our study was to determine feasibility of the analysis of location of mental foramen on panoramic radiographs for gender determination. There was significant difference in the distance from the mental foramen to lower border of the mandible in males and females. Further studies should be done on a large scale to assess the significance of this parameter in gender determination in mass disaster where jaws are available in fragments.

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