

**SEXUAL DIMORPHISM OF LINEAR MEASUREMENTS IN
MANDIBULAR BONE USING DIGITAL ORTHOPANTAMOGRAPHS IN
SOUTH INDIAN POPULATION**

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ABSTRACT :

INTRODUCTION : As age and stature are dependent in the inquiry level of dimorphism, body remnants, and sex reliably plays a significant role, sex identification is a preliminary phase in forensic examination.. Panoramic radiographs, or orthopantomographs, have a wide range of clinical radiological applications in dentistry.

AIM : The aim of the study is to identify sexual dimorphism of linear measurements of mandibular bone using digital orthopantomographs in south indian population

MATERIALS AND METHODS: Digital panoramic radiography were used in a study. The study was done in the south indian population on 50 radiographs in both the genders. Panoramic radiographs with intact dentition were included and that with fracture or deformation were excluded. PMI and MCW are radio morphometric methods. PMI is calculated by measuring the distance between the inferior margins of the mandible and the mental foramen. MCW is calculated by measuring the distance between two parallel lines at the mental foramen's limit. The measurement was carried out using adobe photoshop. Statistical analysis using SPSS was done to determine the gender from the linear measurements.

RESULT: Linear measurements for Mandibular Cortical Width (MCW) and Panoramic Mandibular Index (PMI) were taken. The p value for MCW left is 0.479 which is statistically not significant and p value for MCW right is 0.014 which is statistically significant. The p value for PMI left and right is 0.419 and 0.457 respectively which is statistically not significant between gender

CONCLUSION: The study was done on both the side of the mandible and thus the linear measurement of mandibular bone on digital orthopantomographs is done on the south indian population. From the study it is concluded that PMI can be more preferably used for the measurements and the identification.

KEYWORDS: Forensic identification; orthopantomographs; gender determination; Mandible; Innovative technique.

RUNNING TITLE: Linear measurement of mandibular bone using OPG.

INTRODUCTION:

Age and size are dependent on sex, identifying sex is a preliminary phase in forensic examination. (1). In investigation level of dimorphism, body remnants, sex reliably plays a important role. Sex determination depends on skeletal fragments in mass disasters. Greater the intact skeleton, greater the reliability (2). Other bones like mandible bones, pelvis, skull are also used in gender identification. Most preferred bones are mandible bones. These bones are compact, have high strength and are less destructive. In males and females the masticatory force exerted are different. Mandible bones also show sexual dimorphism because of its shape and size (3). In the identification of human remains, estimating a person's sex from skeletal remains is

critical since it reduces the number of probable matches. Population-specific gender determination is based on morphological characteristics of skeletal materials, so establishing regional standards is one of the most important aspects of modern forensic anatomy. The experience from our previous studies (4) (5,6) (7)(8)(9)(10)(11)(9,11)(12)(13) (14) have led us to concentrate on current study.

Male bones are bigger than the female bones. There are three basic criteria used for the indicator of sex determination. First, the anatomic and physiologic morphology should clearly reflect the sex differences. Second, fossilization and skeletonization should be endured. Third, the trait should be easily recognizable (15). Both the cortical and trabecular bone tissues of the jaw change histomorphometrically and microradiographically (15,16). An odontologist's panoramic radiography for inspecting the mandible has gotten a lot of attention. The panoramic radiography is MCW(Mandibular Cortical Width) and PMI(Panoramic Mandibular Index) serves as diagnostic criteria. Orthopantomographs which provide panoramic X rays are used for taking linear measurements in the mandibular bone. Morphometric analysis is limited to various sites (17). Traditionally, two methods for skeletal sex determination were used that is morphological and metrical. The morphological method involves observation of sexual traits which exhibit sexual dimorphism.

Panoramic radiographs provide anatomic measurements. According to the previous studies the panoramic radiographs provide accurate linear measurements on the mandible. This technique has limitations which result in magnification and geometric distortion. It also has positioning errors. Since all the images are uniformly magnified it doesn't affect the results. With this background an attempt was made to assess the linear measurement of mandibular bone. Studies similar concepts were performed by our team of researches which insisted us to proceed this study.(18–25),(26),(27),(28),(29,30),(31),(32),(33–37)The aim is to determine the sexual dimorphism of linear measurements of mandibular bone on digital orthopantomography in the south indian population.

MATERIALS AND METHODS:

The study was conducted using panoramic radiographs. This study was done on 50 radiographs in both the genders in the south indian population. The study only included OPGs from whole dentate individuals, and OPGs exhibiting fracture deformation disturbance in the mandible were eliminated. On orthopantomographs, mandibular measurements were taken using Adobe Photoshop. Significant measurements were taken. All the measurements were taken in millimeters. The value of the linear measurements were taken on the both left and right side of the mandible. The values of both the right and left side were taken. Statistical analysis was done by collecting the data and was entered in SPSS software. Independent t test and bar graphs were done and the results were collected. Panoramic radiographs with intact dentition were included.

RESULTS:

The linear measurements for mandibular bone were taken on digital orthopantomographs for both males and females. For 50 people both MCW and PCI on both sides of the mandible, photographs were obtained. The independent sample T test for MCW and PCI of mandible bone on right and left side was analysed. For MCW Left the mean values of male and females are 0.1466 and 0.1534, with p value 0.479, which is statistically not significant (Fig -1). For MCW Right the mean values of male and female are found to be 0.1440 and 0.1645 respectively with p value 0.014 which is statistically significant (Fig-2). For PMI Left the mean value for male and female is 0.3609 and 0.3954, the p value is 0.419 and it is statistically not significant (Fig-3). For PMI Right the mean value for male and female is found to be 0.3445 and 0.3707 where the p value is 0.457 which is statistically not significant. (Fig-4)

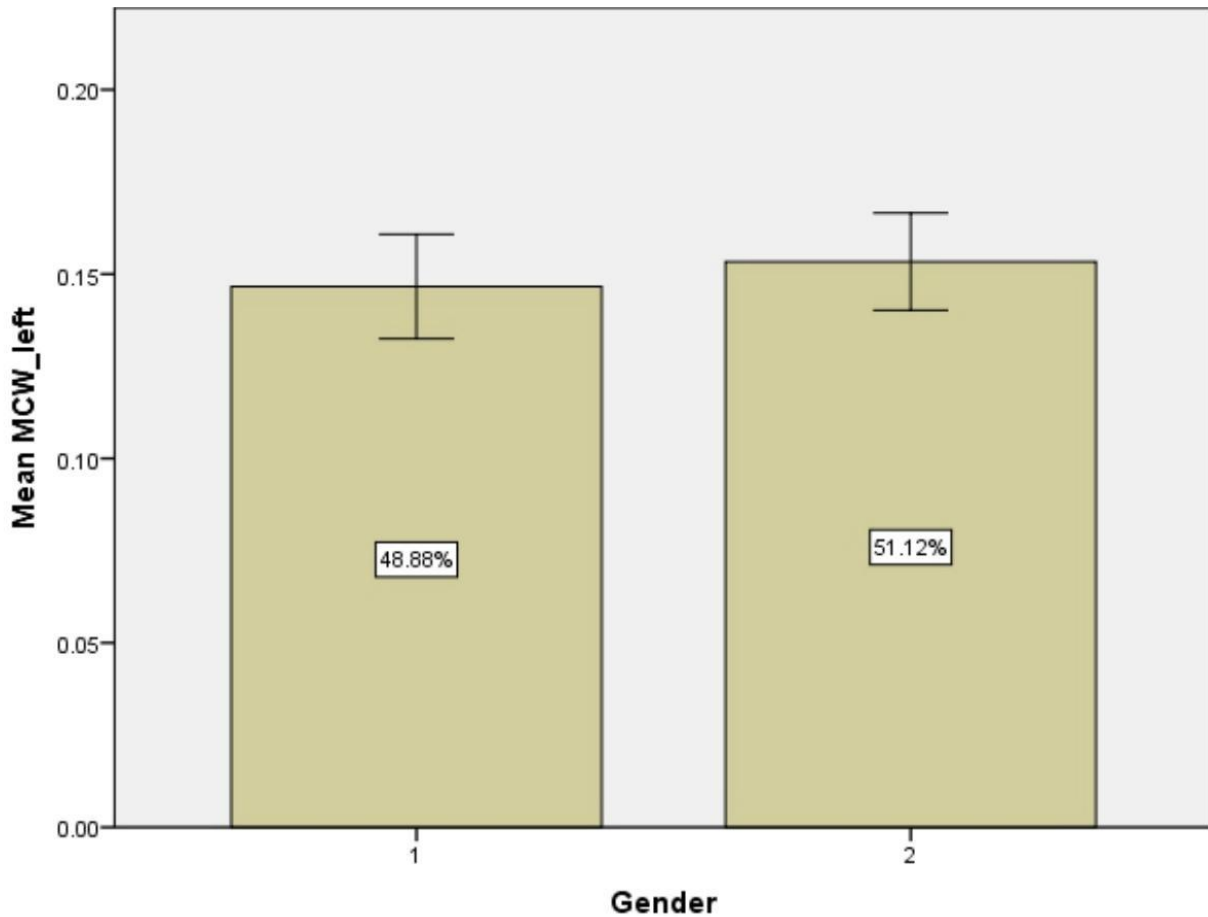


FIG 1 : the graph shows the comparison analysis of mean value of left mandibular cortical

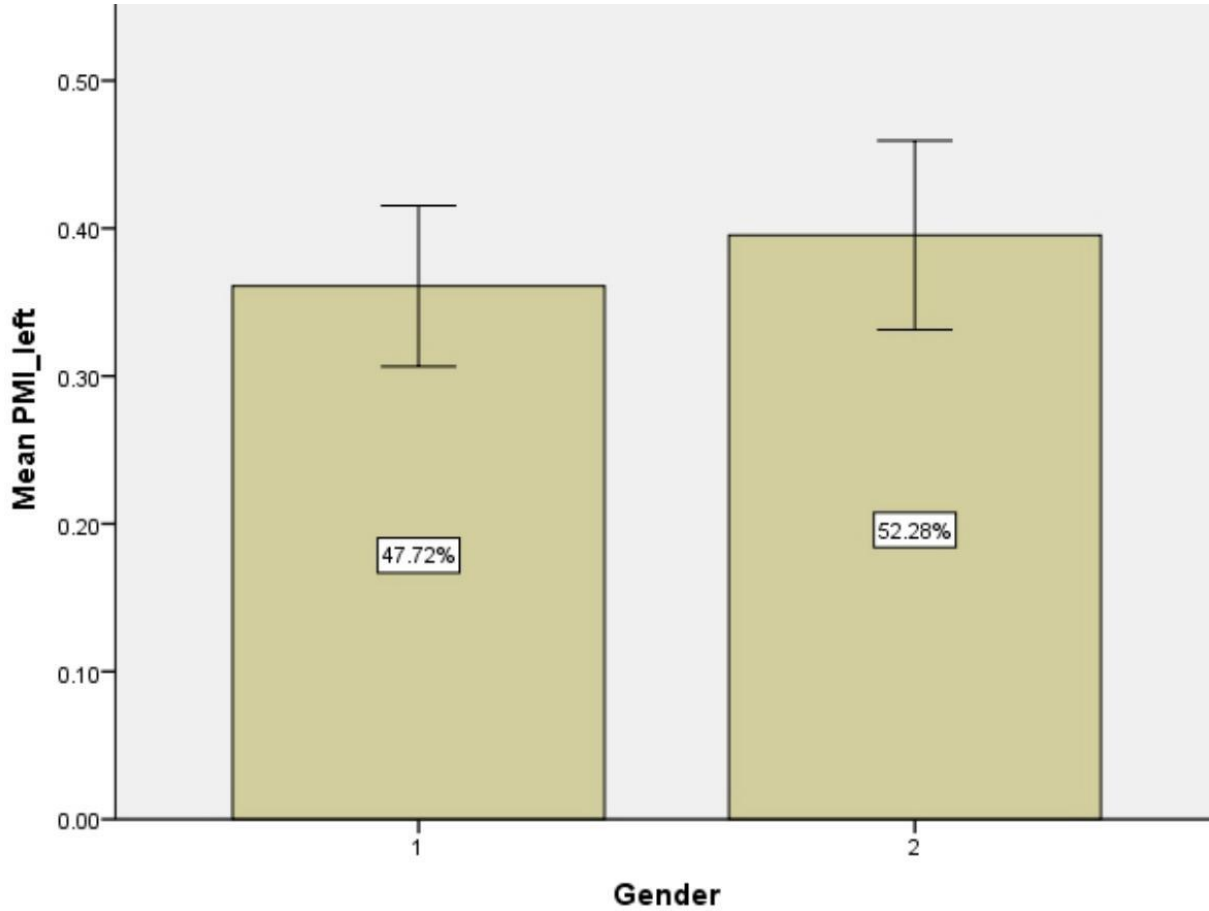


FIG 3 : the graph shows the comparison analysis of mean value of left panoramic mandibular index between gender.

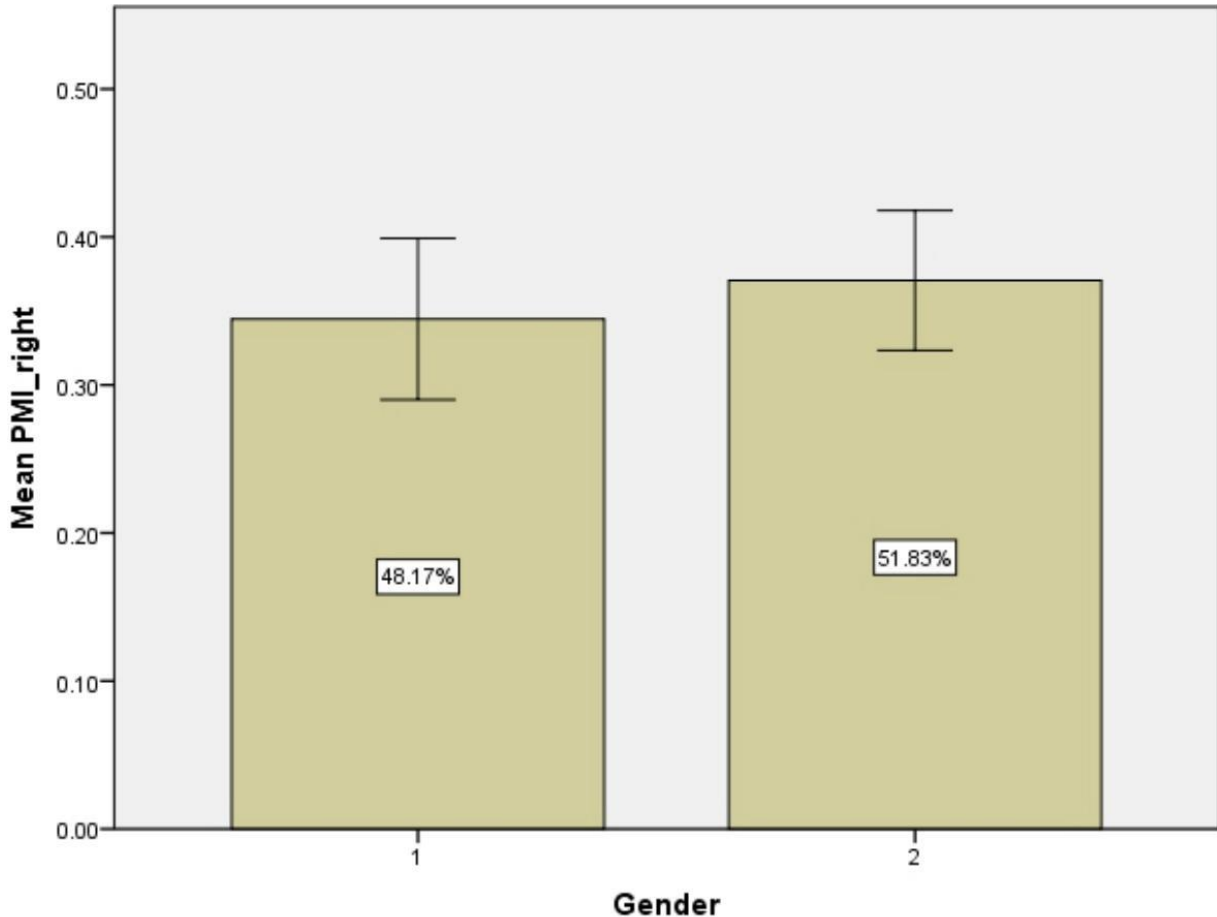


FIG 4 : the graph shows the comparison analysis of mean value of right panoramic mandibular index between gender.

DISCUSSION :

On digital ortho pantographs, the mandibular cortical width and panoramic mandibular index of mandibular bone were calculated and it was found that p value for PMI left and right and MCW was found to be statistically not significant and MCW right was found to be statistically significant. The linear measurement was done on both the sides of the mandible and mandible can be used for determination of sex. In the mandibles of males and females a significant difference has been found which aids us to determine the sex in unidentified mandibles (16).

Size of the mandible is influenced by sexual dimorphic variables which can be determined by size of the tooth, muscle force exerted during mastication. Majority of the population visits the dentist regularly and often OPG are taken(38). The panoramic mandibular index is a radio morphometric method (PMI). It depicts the mandible's height. The height is presented below the edge of the mental foramen. The distance between the foramen and the inferior border of the mandible is one-third of the jaw's whole height in that place and remains constant throughout life. (39). For typical mandibular size, the PMI can be used to determine the mandibular cortical thickness. It's a tool that dental professionals use to assess bone loss. Panoramic radiographs technique is a narrow image layer as it is sensitive to positioning errors but remains as a

diagnostic modality of choice(40). Because the items are outside the focus trough, they are occasionally blurred, enlarged, reduced in size, and deformed. (40,41).

From the previous study done by (42) showed the mean and the significant value of MCW. When compared to our study the values were not statistically significant. The linear measurement of the Panoramic Mandibular Index(PMI) value increases in elderly. PMI value has been performed on women and they found the values to be between 0.31-0.38. (43). From the previous study done by (44) it showed the mean and the significance and the mean value of PCI. when compared with our study the values were more than the previous study. The PMI values are not statistically significant.

The demand for accurate and trustworthy biological sex estimation is increasing. Male and female mandibles have been observed to differ significantly. Low levels of sexual dimorphism have been linked to inherited hormonal or endocrine growth factors, as well as socioeconomic issues. (45). Each of the characteristics assessed using a panoramic radiograph of the mandibles revealed statistically significant sex differences between sexes, indicating sexual dimorphism. Each observation was independently measured by PCI and MCW on both the sides of the OPG at the mental foramen region. The panoramic mandibular index is discovered to be useful and can be much preferably used for the measurement and the identification as it has higher mean value when compared to mandibular cortical width.

CONCLUSION:

The mandible can be used to determine an individuals gender. Within the study's constraints, it was discovered that the panoramic mandibular index may be much more effectively employed for measurement and identification since it has a higher mean value than mandibular cortical width.. Thus it is concluded that sexual dimorphism of linear measurement of mandibular bone can be done on digital orthopantomograph in the population of south India. The future scope of the study is it will be conducted in the Northern and Western population.

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CONFLICT OF INTEREST:

The author declares that there was no conflict of interest in the present study.

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