

# **Gender Determination Using Odontometric Measurement Of Mandible**

**Running Title - Gender determination using mandibular odontometry**

**Jessly Daniel**

Department of Anatomy

Saveetha Dental College and Hospitals,

Saveetha Institute of Medical and Technical Sciences,

Saveetha University, Chennai - 600077.

Email id: [jesslydaniel69@gmail.com](mailto:jesslydaniel69@gmail.com)

**Yuvaraj Babu.K**

Department of Anatomy,

Saveetha Dental College & Hospitals,

Saveetha Institute of Medical and Technical Sciences,

Saveetha University, Chennai - 600077.

Email id: [yuvarajbabu@saveetha.com](mailto:yuvarajbabu@saveetha.com)

**Corresponding Author**

**K.Yuvaraj Babu**

Department of Anatomy,

Saveetha Dental College and Hospitals,

Saveetha Institute of Medical and Technical Sciences,

Saveetha University, Velappanchavadi,

Chennai - 600077, Tamilnadu, India.

Phone: +91-9840210597 e-mail: [yuvarajbabu@saveetha.com](mailto:yuvarajbabu@saveetha.com)

**ABSTRACT:**

**Introduction:**

Teeth is the best mineralised body tissue against various destructive agents. Teeth are extensively used for reconstructive identification. They are useful in the determination of gender by using different odontometric techniques and is useful in case of major catastrophes when bodies are often damaged beyond recognition. male teeth have been found to be larger than those of the female.

**Aim:**

The aim of the research is to determine gender using odontometric measurements of width of mandibular 2nd inter premolar distance

**Materials and methods:** The study sample consists of 60 people (30 males and 30 females) and age groups from 18 - 20 years. The measurements of width between the 2nd mandibular premolar. All the measurements were taken using a Digital Vernier Caliper. For one person, an average of three different values were taken. After collecting the data, it was uploaded in Excel sheet and then uploaded in SPSS software version 23.

**Result:** Wilcoxon Signed Rank test was done. The p value was 0.009 that is less than 0.05. That is gender determination can be done using odontometric measurements of the mandible

**Conclusion:** From the present study it was found sexual dimorphism can be determined using mandibular 2nd inter premolar width,

**Keywords:** odontometric measurement , mandible , novel gender determination,.2nd premolar

**INTRODUCTION:**

Teeth is the best mineralised body tissue against various destructive agents. Teeth are extensively used for reconstructive identification. They are also used for gender determination using odontometric measurement.(1) Various methods used for sex determination are mandibular canine index, mesiodistal width measurement of maxillary incisor, canine and first molar. Male teeth are larger than females. This method can be a problem due to crowding, attrition, cervical abrasion, presence of dental calculus etc.(2)

The durability of dentition to survive fire, bacterial decomposition etc makes it invaluable for identification of investigative features in the adult bones. Gender may be determined by the skull measurement, long bone dimension, pelvic structure etc, tooth enamel can withstand high temperature, humidity, desiccation, extensive trauma etc;(3). Odontometric studies of teeth plays a major role as strength of the teeth and its resistance to destruction or breakage after death.

Widely used crown dimensions are measurements of maximum mesiodistal and buccolingual. But these measurements are difficult to get in teeth that are worn off(4). Gender determination has chief importance in forensic investigation sex determination can be done by DNA analysis, osteometry, odontometric parameters. Osteometry is not preferred because the bodies will be badly mutilated. (5)odontometric measurements exhibit sexual dimorphism. 70% of identifications are obtained from forensic dentistry; it is a great alternative for DNA analysis. Molars have greater potential for sex determination. When visual identification of sex is impossible, we can use odontometric measurement to determine the identity of a person(5,6).

Teeth is a very important part of the masticatory apparatus in human skull and act as a good source of materials for medico legal and civil identification(5–7), as the teeth provide resistance to any damages that may be caused by fire, fracture or bacterial decomposition. Sexual dimorphism refers to the difference in the size, structure, appearance between teeth of male and female. Various cultural, environmental, racial and genetic factors may determine the size of tooth (8). The extensive knowledge and experience of our research team has been translated into high quality publications (9–16),(17),(18),(19),(20,21),(22),(23),(24–28). The aim of the research is to determine gender using odontometric measurements of width of mandibular 2nd inter premolar distance

#### **MATERIALS AND METHODS:**

The study population was taken from the dental students of Saveetha dental College and hospitals, Chennai. The sample size chosen for the study was 60, which included 30 females and 30 males. A digital verniers caliper, with accurate adjustments were used to measure the inter-2nd premolar mandibular distance of the participants with their prior consent. The premolar distance was taken by inserting the digital verniers caliper into the oral cavity of the subjects and the distance from the buccal surface of the mandibular right second premolar to the buccal surface of the mandibular left second premolar was measured. Separate measurements were taken for males and females to use the data collected for analysing whether the second mandibular premolar odontometric measurement can be useful for determination of gender. The collected data was tabulated then subjected to statistical analysis using SPSS software and related samples Wilcoxon signed rank test was done.



**Figure 1: measurement of 2nd premolar mandible**

**RESULT:**

Table 1- Range, mean and standard deviation of mandibular 2nd interpremolar width in males and females

Mandibular 2nd inter premolar width in cms	N	MINIMUM	MAXIMUM	MEAN	STANDARD DEVIATION
Male	30	35.32	52.55	46.59	4.01
Female	30	34.27	52.55	43.28	4.47

\*p value was 0.009 (p<0.05)

The mean value is 46.59cm for male and 43.28 for female, the standard deviation for male is 4.01 and 4.47 for female. The p value was 0.009 (p<0.05). So, it was statistically significant, hence sexual dimorphism can be determined using mandibular 2nd inter premolar width.

**DISCUSSION:**

The previous studies has established statistically significant sexual dimorphism using measurements of mandibular canine.(29) Studies have also established that the intercanine distance and mandibular canine index as a very useful parameter for gender determination (30). In a study it was determined that the y chromosomes is responsible by controlling the thickness of dentine, whereas the x chromosome is concerned with the thickness of enamel determining the

size of tooth (31). The mesiodistal width of mandibular canines are considered to show greater accuracy of sexual dimorphism among all teeth. Odontometric measurements on various tooth groups with the aim of determining measurements that can serve as standard in dental surgery and forensic odontology.(32) Identification of person from tooth can be done by comparative method or dental profiling after death. Various odontometric dimension could be used for gender determination (33).

Previous studies have proved that the mesiodistal width of canine teeth of the mandibular canines demonstrated better sexual dimorphism than maxillary canine (33). Any tooth measurements done without information about age, sex or race must be done with great care. The correct identification of gender through skeletal remains is one of the major challenges in forensic anthropology as a reliable biological feature (34). The various factors can contribute to gender differences in tooth like environment, food habits, cultural and genetic (35). Gender determination using dental records has been widely accepted as a reliable biological measurement like skeletal remains in different people (36). The odontometric parameters shows significant differences between specific populations and even within the same population hence there is a need to determine odontometric measurements that are specific to certain region or population be helpful in forensic investigation (35,37).

#### **LIMITATIONS:**

The sample size taken for the study was considerably small and the results of the study can not be generalized.

#### **FUTURE SCOPE:**

To increase the sample size and also to include people with various age group and race,

#### **CONCLUSION:**

From the present study it was found sexual dimorphism can be determined using mandibular 2nd inter premolar width, Significant dimorphic differences were found in width of mandibular 2nd inter premolar teeth between sexes and males exhibited larger width than females. So odontometric measurement of mandibles was found to be a reliable source of gender determination.

#### **AUTHOR CONTRIBUTIONS**

Jessly Daniel: Study Design, Data collection, Data Analysis, manuscript writing

Yuvaraj Babu K: Study Concept, Data verification, Data Analysis, manuscript drafting and correction

#### **ACKNOWLEDGEMENT**

We acknowledge and thank all the participants for their cooperation in the study

### CONFLICT OF INTEREST

The authors reported the conflict of interest while performing this study to be nil

### FUNDING AGENCY

The present project is supported/funded/sponsored by

- Saveetha Institute of Medical and Technical Sciences
- SaveethaDental College and Hospitals.
- Saveetha University and
- Kuwait Oil Company

### REFERENCE:

1. Sm K, Kazzazi SM, Kranioti EF. Odontometric analysis of sexual dimorphism in permanent maxillary and mandibular molars [Internet]. Vol. 5, Journal of Forensic Science & Criminology. 2017. Available from: <http://dx.doi.org/10.15744/2348-9804.5.102>
2. Kondo S, Townsend GC. Sexual dimorphism in crown units of mandibular deciduous and permanent molars in Australian Aborigines [Internet]. Vol. 55, HOMO. 2004. p. 53–64. Available from: <http://dx.doi.org/10.1016/j.jchb.2003.10.001>
3. Erratum: Sexual dimorphism in permanent maxillary and mandibular canines and intermolar arch width: Endemic study [Internet]. Vol. 27, Journal of Indian Academy of Oral Medicine and Radiology. 2015. p. 629. Available from: <http://dx.doi.org/10.4103/0972-1363.188780>
4. Shrestha B. Sexual Dimorphism in Permanent Maxillary and Mandibular Canine of Medical Students in Gandaki Medical College, Nepal [Internet]. Vol. 4, Birat Journal of Health Sciences. 2019. p. 654–9. Available from: <http://dx.doi.org/10.3126/bjhs.v4i1.23941>
5. M A-A, Al-Assaf M, Department of Oral Histology and Pathology, Faculty of Dentistry, Damascus University, Damascus, et al. Evaluation of Sexual Dimorphism in Maxillary Right First and Second Molars and Mandibular Left Canine in Syrians [Internet]. International Journal of Dentistry and Oral Science. 2020. p. 743–6. Available from: <http://dx.doi.org/10.19070/2377-8075-20000146>
6. Bajracharya M, Omar BK, Maharjan SK. Odontometric Analysis of Permanent Mandibular Canine to Determine Sexual Dimorphism: A Preliminary Study [Internet]. Vol. 1, Journal of Nepalese Prosthodontic Society. 2018. p. 80–5. Available from: <http://dx.doi.org/10.3126/jnprossoc.v1i2.23861>
7. Garg D, Goje S. Evaluation of mesiodistal inclination of permanent maxillary and mandibular first molars in different Angle's molar relation: A cephalometric study

- [Internet]. Vol. 6, Journal of Integrated Health Sciences. 2018. p. 8. Available from: [http://dx.doi.org/10.4103/jihs.jihs\\_5\\_18](http://dx.doi.org/10.4103/jihs.jihs_5_18)
8. Sorenti M, Martín-Torres M, Martín-Francés L, Perea-Pérez B. Sexual dimorphism of dental tissues in modern human mandibular molars [Internet]. Vol. 169, American Journal of Physical Anthropology. 2019. p. 332–40. Available from: <http://dx.doi.org/10.1002/ajpa.23822>
  9. Sekar D, Lakshmanan G, Mani P, Biruntha M. Methylation-dependent circulating microRNA 510 in preeclampsia patients. *Hypertens Res.* 2019 Oct;42(10):1647–8.
  10. Princeton B, Santhakumar P, Prathap L. Awareness on Preventive Measures taken by Health Care Professionals Attending COVID-19 Patients among Dental Students. *Eur J Dent.* 2020 Dec;14(S 01):S105–9.
  11. Logeshwari R, Rama Parvathy L. Generating logistic chaotic sequence using geometric pattern to decompose and recombine the pixel values. *Multimed Tools Appl.* 2020 Aug;79(31-32):22375–88.
  12. Johnson J, Lakshmanan G, M B, R M V, Kalimuthu K, Sekar D. Computational identification of MiRNA-7110 from pulmonary arterial hypertension (PAH) ESTs: a new microRNA that links diabetes and PAH. *Hypertens Res.* 2020 Apr;43(4):360–2.
  13. Paramasivam A, Priyadharsini JV, Raghunandhakumar S, Elumalai P. A novel COVID-19 and its effects on cardiovascular disease. *Hypertens Res.* 2020 Jul;43(7):729–30.
  14. Pujari GRS, Subramanian V, Rao SR. Effects of *Celastrus paniculatus* Willd. and *Sida cordifolia* Linn. in Kainic Acid Induced Hippocampus Damage in Rats. *Ind J Pharm Educ.* 2019 Jul 3;53(3):537–44.
  15. Rajkumar KV, Lakshmanan G, Sekar D. Identification of miR-802-5p and its involvement in type 2 diabetes mellitus. *World J Diabetes.* 2020 Dec 15;11(12):567–71.
  16. Ravisankar R, Jayaprakash P, Eswaran P, Mohanraj K, Vinitha G, Pichumani M. Synthesis, growth, optical and third-order nonlinear optical properties of glycine sodium nitrate single crystal for photonic device applications. *J Mater Sci: Mater Electron.* 2020 Oct;31(20):17320–31.
  17. Wu S, Rajeshkumar S, Madasamy M, Mahendran V. Green synthesis of copper nanoparticles using *Cissus vitiginea* and its antioxidant and antibacterial activity against urinary tract infection pathogens. *Artif Cells Nanomed Biotechnol.* 2020 Dec;48(1):1153–8.
  18. Vikneshan M, Saravanakumar R, Mangaiyarkarasi R, Rajeshkumar S, Samuel SR, Suganya

- M, et al. Algal biomass as a source for novel oral nano-antimicrobial agent. *Saudi J Biol Sci.* 2020 Dec;27(12):3753–8.
19. Alharbi KS, Fuloria NK, Fuloria S, Rahman SB, Al-Malki WH, Javed Shaikh MA, et al. Nuclear factor-kappa B and its role in inflammatory lung disease. *Chem Biol Interact.* 2021 Aug 25;345:109568.
  20. Rao SK, Kalai Priya A, Manjunath Kamath S, Karthick P, Renganathan B, Anuraj S, et al. Unequivocal evidence of enhanced room temperature sensing properties of clad modified Nd doped mullite Bi<sub>2</sub>Fe<sub>4</sub>O<sub>9</sub> in fiber optic gas sensor [Internet]. Vol. 838, *Journal of Alloys and Compounds.* 2020. p. 155603. Available from: <http://dx.doi.org/10.1016/j.jallcom.2020.155603>
  21. Bhavikatti SK, Karobari MI, Zainuddin SLA, Marya A, Nadaf SJ, Sawant VJ, et al. Investigating the Antioxidant and Cytocompatibility of *Mimusops elengi* Linn Extract over Human Gingival Fibroblast Cells. *Int J Environ Res Public Health* [Internet]. 2021 Jul 4;18(13). Available from: <http://dx.doi.org/10.3390/ijerph18137162>
  22. Marya A, Karobari MI, Selvaraj S, Adil AH, Assiry AA, Rabaan AA, et al. Risk Perception of SARS-CoV-2 Infection and Implementation of Various Protective Measures by Dentists Across Various Countries. *Int J Environ Res Public Health* [Internet]. 2021 May 29;18(11). Available from: <http://dx.doi.org/10.3390/ijerph18115848>
  23. Barma MD, Muthupandiyani I, Samuel SR, Amaechi BT. Inhibition of *Streptococcus mutans*, antioxidant property and cytotoxicity of novel nano-zinc oxide varnish. *Arch Oral Biol.* 2021 Jun;126:105132.
  24. Vijayashree Priyadharsini J. In silico validation of the non-antibiotic drugs acetaminophen and ibuprofen as antibacterial agents against red complex pathogens. *J Periodontol.* 2019 Dec;90(12):1441–8.
  25. Priyadharsini JV, Vijayashree Priyadharsini J, Smiline Girija AS, Paramasivam A. In silico analysis of virulence genes in an emerging dental pathogen *A. baumannii* and related species [Internet]. Vol. 94, *Archives of Oral Biology.* 2018. p. 93–8. Available from: <http://dx.doi.org/10.1016/j.archoralbio.2018.07.001>
  26. Uma Maheswari TN, Nivedhitha MS, Ramani P. Expression profile of salivary micro RNA-21 and 31 in oral potentially malignant disorders. *Braz Oral Res.* 2020 Feb 10;34:e002.
  27. Gudipani RK, Alam MK, Patil SR, Karobari MI. Measurement of the Maximum Occlusal Bite Force and its Relation to the Caries Spectrum of First Permanent Molars in Early Permanent Dentition. *J Clin Pediatr Dent.* 2020 Dec 1;44(6):423–8.



28. Chaturvedula BB, Muthukrishnan A, Bhuvanaraghan A, Sandler J, Thiruvengkatachari B. Dens invaginatus: a review and orthodontic implications. *Br Dent J.* 2021 Mar;230(6):345–50.
29. Thijeel AT. Gender Determination by Using Dimorphism in Permanent Maxillary and Mandibular Canines in Iraqi Adults [Internet]. Vol. 11, *International Journal for Sciences and Technology.* 2016. p. 24–8. Available from: <http://dx.doi.org/10.12816/0023798>
30. Paknahad M, Vossoughi M, Ahmadi Zeydabadi F. A radio-odontometric analysis of sexual dimorphism in deciduous dentition. *J Forensic Leg Med.* 2016 Nov;44:54–7.
31. Chandra A, Agnihotri A, Saran V, Mishra M. Sexual dimorphism by odontometric evaluation of permanent canine teeth: A study from three cities [Internet]. Vol. 3, *International Journal of Forensic Odontology.* 2018. p. 66. Available from: [http://dx.doi.org/10.4103/ijfo.ijfo\\_24\\_18](http://dx.doi.org/10.4103/ijfo.ijfo_24_18)
32. Manjunatha B, Agrawal A, Dholia B, Althomali Y. Comparison of sexual dimorphism of permanent mandibular canine with mandibular first molar by odontometrics [Internet]. Vol. 7, *Journal of Forensic Dental Sciences.* 2015. p. 238. Available from: <http://dx.doi.org/10.4103/0975-1475.172449>
33. Babu SS, Nair SS, Gopakumar D, Kurian N, Parameswar A, Baby TK. Linear Odontometric Analysis of Permanent Dentition as A Forensic Aid: A Retrospective Study. *J Clin Diagn Res.* 2016 May;10(5):ZC24–8.
34. Sharma S, Dinkar AD, Bedi S. Odontometric sexual dimorphism: a sibling correlation. *J Clin Diagn Res.* 2014 Mar;8(3):233–5.
35. Gupta S. Establishment of Sexual Dimorphism in North Indian Population by Odontometric Study of Permanent Maxillary Canine [Internet]. Vol. 05, *Journal of Forensic Research.* 2014. Available from: <http://dx.doi.org/10.4172/2157-7145.1000224>
36. Grewal DS. Morphometric Analysis of Odontometric Parameters for Gender Determination [Internet]. *JOURNAL OF CLINICAL AND DIAGNOSTIC RESEARCH.* 2017. Available from: <http://dx.doi.org/10.7860/jcdr/2017/26680.10341>
37. Grewal DS, Khangura RK, Sircar K, Tyagi KK, Kaur G, David S. Morphometric Analysis of Odontometric Parameters for Gender Determination. *J Clin Diagn Res.* 2017 Aug;11(8):ZC09–13.