Nat. Volatiles & Essent. Oils, 2021; 8(5): 7238 - 7245

Gender Determination Using Mandibular Central Incisor Among Chennai Population. - An Observational Study

Aashiq Mohamed P
Undergraduate student
Saveetha Dental College and Hospitals
Saveetha Institute of medical and technical sciences
Saveetha university,
Chennai - 600077

Reshma Poothakulath Krishnan
Senior Lecturer
Department of Oral Pathology
Saveetha Dental college and hospitals,
Saveetha institute of medical and technical sciences
Saveetha university,
Chennai - 600077
reshmapk.sdc@saveetha.com

Sandhya Sundar
Senior Lecturer
Department of Oral Pathology
Saveetha Dental college and hospitals,
Saveetha institute of medical and technical sciences
Saveetha university,
Chennai - 600077
sandhyas.sdc@saveetha.co

Abstract:

Background: Structural and behavioural changes which occur between different sexes from the same species is known as sexual dimorphism. Incisor is one of the sharpest teeth in the human dentition. Mandibular incisors are adjacent to the midline of the face and meisial from both mandibular lateral incisors. This tooth has been chosen for gender estimation as it is the first tooth emerging in the oral cavity.

Aim: To assess the gender dimorphism of the mandibular central incisor among Chennai population.

Methods and material: This study was conducted on 40 mandibular casts. Mandibular casts of individuals in the age group of 18-25 years were included in the study. The mesiodistal width of central mandibular incisors were measured by using digital vernier calipers. The values which are recorded and statistically analyzed using an independent t-test.

Result: The mesiodistal width of the central mandibular incisor was slightly more in females (mean= 4.86mm + or - 0.53) compared to that of males (mean= 4.84mm + or - 0.42). The p value was found to be 0.11 (>0.05), and is not statistically significant.

Conclusion: Measurement of mandibular central incisor might be useful to determine the gender dimorphism. These metric measurements are simple, quick, inexpensive methods for gender determination of an individual.

Keywords: Sexual dimorphism, mandibular central incisor, mesiodistal width, innovative technique, novel method.

Introduction:

Identification of tooth number, size and shape has important clinical significance in many dental disciplines, particularly pediatric dentistry such as oral surgery , etc (1). The dental formula for permanent dentition in human beings consist of two incisors, a canine, two premolars and three molars in each half of the jaw (2). The importance of recognition of morphological and anatomical-functional characteristics of teeth, seeking adaptation to individual conditions (2,3). Tooth size standards based on investigations in odontometrics can be used in age and sex determination as human teeth which exhibits sexual dimorphism (4). The importance of odontometrics in determination of gender has been reflected in various studies carried out on the subject across the whole world (5). The anterior teeth are more important in dental and facial esthetics. The mandibular central incisor occupies a strategic position in the centre of the upper portion of the arch (6).

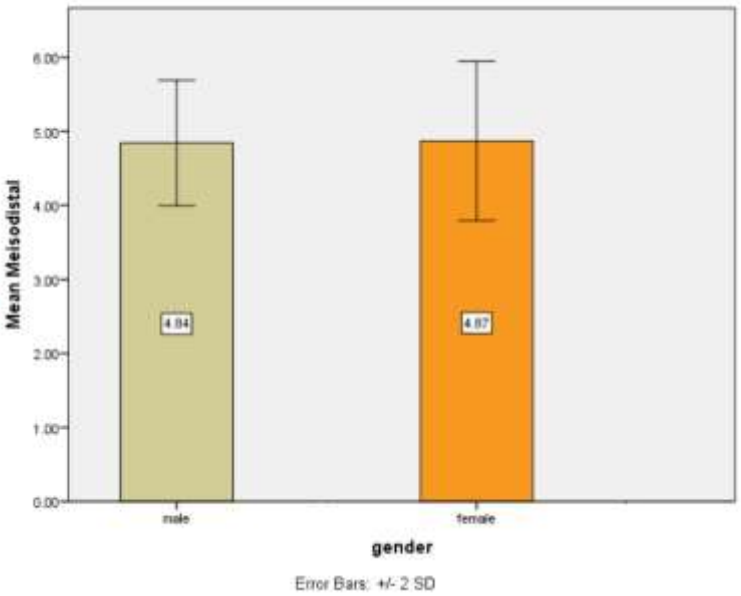
The mesio-distal and Bucco-lingual diameter of the permanent tooth crown are the two most commonly used and researched features used in the identification of sex on the basis of dental measurements (7). Males usually have larger teeth than females by using both crown and cervical measurements of permanent dentition [8(8)]. To analyse the other dental measurements such as tissue volumes, which has been less common than traditional crown diameters, but tissue volumes and surface areas have also been identified as sexually dimorphic (9). Despite being used infrequently, the use of dental tissue volumes and surface areas has been recommended for sex determination (10). Although the degree of dimorphism varies within different populations, sexual variation in human skeleton and dentition is of great concern for anthropologists (11).

Recent studies have shown that the most dimorphic tooth is the mandibular incisor and it can be of immense medicolegal use in identification (11,12). Studies show that dental traits depend on genetics and environmental factors such as area of residence (11–13). To our knowledge, no study has been done so far using mandibular central incisors. Our team has extensive knowledge and research experience that has translated into high quality publications (14-33). Therefore the current study is the first of its kind, aimed to assess the sexual dimorphism in mandibular central incisors by measuring their mesiodistal width.

Material and methods:

A cross-sectional, hospitals based study was conducted among the chennai population. Mandibular casts were selected from the Department of Oral Pathology, Saveetha Dental College and Hospitals, Chennai. The total number of cast selected were 40 with 20 casts each in male and female. Only the participants between the age group of 18-25 were included in the study. The study was approved by the institutional ethics committee of Saveetha Dental College and Hospital. Individuals with healthy periodontium and dental cavity-free mandibular central incisor were included in the present study. Each experimental sample was assigned a code to avoid observer bias. The mesiodistal diameter of the mandibular incisors were measured by using digital vernier caliper and simultaneously was recorded in excel sheet and statistically analysed to assess the gender using t-test. The statistical

analysis was performed to assess the difference gender using t-test in SPSS software version 23 and significance was considered when p value was <0.05.



Result:

This study was conducted to determine the differences between the mesiodistal width of mandibular incisor between males and females. When the mesiodistal width of the central incisors were compared (Table 1), the mean measurement in males was obtained as 4.8442 mm and that of females was obtained as 4.8695 mm. T-test for equality of means shows p value of 0.117 (p value >0.05) which was not significant (Fig 1).

TABLE 1:

gender	N	Mean (mm)	std.deviation	Std.error mean	P value
male	19	4.8442	.42402	.09728	0.117
female	21	4.8695	.53812	.11743	

Table 1 Depicts the mean, standard deviation and standard error mean values of mesio-distal width of mandibular central incisor of males and females. The mean mesiodistal width of females (4.8695 mm) were slightly higher when compared to males (4.8442 mm). The results were not statistically significant. (T-test for equality of means, p= 0.117)

Fig 1: This graph shows the association of gender and the mesiodistal width of mandibular central incisor in males and females. The X-axis represents the gender and the Y-axis represents the mean mesiodistal width of mandibular central incisor. Olive colour represents the mean width of male and

the orange colour represents the mean width of female. The mean MD width of females (4.87 mm) is slightly higher when compared to males (4.84 mm). This difference was statistically not significant (T-test for equality of means, p value= 0.117- not significant).

Discussion:

From the results of this study, it can be noted that the sexual dimorphism is present in mandibular central incisors, but the values were not statistically significant. Mandible is the largest, strongest and movable part of the skull. The teeth along with skull are best preserved part of human remains.Mandibular teeth and its variations in age, sex and race will help surgeons, physicians, medico-legal authorities and anthropologists to give correct interpretations for the results of diagnostic procedures in living as well as deceased individuals.

The tooth crown size is a valuable tool and provides significant information on biological alterations(34) human evolution(35), clinical odontology(36) and in forensic evaluation (37). Tooth size is affected by racial and genetic(38), cultural, environmental and environmental factors. Odontometrics can be used in age and sex determination in forensic odontology.

The sexual dimorphism is more pronounced in permanent dentition when compared to the deciduous teeth. The magnitude and pattern of sexual dimorphism in the size of permanent teeth also differ from one population to another. This can differ according to the geographical variations. Most of the studies on sexual dimorphism were done on mandibular canine. Only two studies were reported where maxillary incisors were analysed for gender determination(11,12). To the best of our knowledge no studies analysed the sexual dimorphism of mandibular central incisors. In our study, the mesiodistal width was significantly greater in females than in males. The following study gives the importance of gender dimorphism, where it clearly showed that the size of female incisors were significantly larger than the males and showed the dimorphism which is irreleventally opposite to the study conducted . (39)stated that teeth dimorphism is slightly lower compared to canines. Different factors can also affect the size and dimorphism of a tooth (40), it also depends on proper maintenance of the teeth and also nutrition taken. Results obtained in this study may be different compared to other studies on odontometrics. This can be due to the very small sample size, the cast which has been collected is very few in number and not sufficient to determine a wide range of population. It is collected only among the Chennai population which will not be enough and requires a wide range of samples to come for a clear conclusion to determine gender dimorphism. As there are very few studies conducted regarding this topic of sexual dimorphism among the Chennai population, it will be useful in forensic odontology and less time consumed during the identification and examination of specimens.

Conclusion:

In the present study, however, male–female differences in the mesiodistal width of mandibular incisor have been found, the result seems to be insignificant indicating that it is not possible to differentiate the two sexes on the basis of measurements of the incisors. Further research is warranted to evaluate other teeth as well for any other estimation regarding gender.

Acknowledgements:

The authors would like to thank Saveetha dental college for the valuable support to conduct the study.

Conflict of interest:

All the authors declare that there was no conflict of interest in the present study.

Source of funding:

The present study was supported by the following agencies

- Saveetha Dental College,
- Saveetha Institute of Medical and Technical Science,
- Saveetha University
- Royal Medicals, Chennai.

References:

1. Brook AH, Jernvall J, Smith RN, Hughes TE, Townsend GC. The dentition: the outcomes of morphogenesis leading to variations of tooth number, size and shape. Aust Dent J. 2014 Jun;59 Suppl 1:131–42.

2. Jussila M, Thesleff I. Signaling networks regulating tooth organogenesis and regeneration, and the specification of dental mesenchymal and epithelial cell lineages. Cold Spring Harb Perspect Biol. 2012 Apr 1;4(4):a008425.

3. Fronty P, Georget C, Sapanet M. Teeth Present, Teeth Missing and Probability: Usefulness in Comparative Identification [Internet]. Acta Medicinæ Legalis Vol. XLIV 1994. 1995. p. 331–3. Available from: http://dx.doi.org/10.1007/978-3-642-79523-7_110

4. Garn SM, Lewis AB, Kerewsky RS. Shape similarities throughout the dentition. J Dent Res. 1967 Nov;46(6):1481.

5. Khangura R, Sircar K, Singh S, Rastogi V. Sex determination using mesiodistal dimension of permanent maxillary incisors and canines [Internet]. Vol. 3, Journal of Forensic Dental Sciences. 2011. p. 81. Available from: http://dx.doi.org/10.4103/0975-1475.92152

6. Townsend G, Kanazawa E, Takayama H. New Directions in Dental Anthropology: Paradigms, Methodologies and Outcomes. University of Adelaide Press; 2012. 137 p.

7. Işcan MY, Kedici PS. Sexual variation in bucco-lingual dimensions in Turkish dentition. Forensic Sci Int. 2003 Nov 26;137(2-3):160–4.

8. Jensen E, Kai-Jen Yen P, Moorrees CF, Thomsen SO. Mesiodistal crown diameters of the deciduous and permanent teeth in individuals. J Dent Res. 1957 Feb;36(1):39–47.

9. Geis-Gerstorfer J. In vitro corrosion measurements of dental alloys [Internet]. Vol. 22, Journal of Dentistry. 1994. p. 247–51. Available from: http://dx.doi.org/10.1016/0300-5712(94)90124-4

10. García-Campos C, Martinón-Torres M, Martínez de Pinillos M, Modesto-Mata M, Martín-Francés L, Perea-Pérez B, et al. Modern humans sex estimation through dental tissue patterns of maxillary canines. Am J Phys Anthropol. 2018 Dec;167(4):914–23.

11. Brown DE. Human biological variation in the skeleton and dentition [Internet]. Human Biological Diversity. 2019. p. 152–80. Available from: http://dx.doi.org/10.4324/9781315177861-6

12. Bakkannavar SM, Monteiro FNP, Arun M, Pradeep Kumar G. Mesiodistal width of canines: a tool for sex determination [Internet]. Vol. 52, Medicine, Science and the Law. 2012. p. 22–6. Available from: http://dx.doi.org/10.1258/msl.2011.010152

13. Acharya AB, Angadi PV, Prabhu S, Nagnur S. Validity of the mandibular canine index (MCI) in sex prediction: Reassessment in an Indian sample. Forensic Sci Int. 2011 Jan 30;204(1-3):207.e1–4.

14. 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.

15. Mathew MG, Samuel SR, Soni AJ, Roopa KB. Evaluation of adhesion of Streptococcus mutans, plaque accumulation on zirconia and stainless steel crowns, and surrounding gingival inflammation in primary molars: randomized controlled trial. Clin Oral Investig. 2020 Sep;24(9):3275–80.

16. Sridharan G, Ramani P, Patankar S, Vijayaraghavan R. Evaluation of salivary metabolomics in oral leukoplakia and oral squamous cell carcinoma. J Oral Pathol Med. 2019 Apr;48(4):299–306.

17. R H, Hannah R, Ramani P, Ramanathan A, Jancy MR, Gheena S, et al. CYP2 C9 polymorphism among patients with oral squamous cell carcinoma and its role in altering the metabolism of benzo[a]pyrene [Internet]. Vol. 130, Oral Surgery, Oral Medicine, Oral Pathology and Oral Radiology. 2020. p. 306–12. Available from: http://dx.doi.org/10.1016/j.oooo.2020.06.021

18. Antony JVM, Ramani P, Ramasubramanian A, Sukumaran G. Particle size penetration rate and effects of smoke and smokeless tobacco products - An invitro analysis. Heliyon. 2021 Mar 1;7(3):e06455.

19. Sarode SC, Gondivkar S, Sarode GS, Gadbail A, Yuwanati M. Hybrid oral potentially malignant disorder: A neglected fact in oral submucous fibrosis. Oral Oncol. 2021 Jun 16;105390.

20. Hannah R, Ramani P, WM Tilakaratne, Sukumaran G, Ramasubramanian A, Krishnan RP. Author response for “Critical appraisal of different triggering pathways for the pathobiology of pemphigus vulgaris—A review” [Internet]. Wiley; 2021. Available from: https://publons.com/publon/47643844

21. Chandrasekar R, Chandrasekhar S, Sundari KKS, Ravi P. Development and validation of a formula for objective assessment of cervical vertebral bone age. Prog Orthod. 2020 Oct 12;21(1):38.

22. Subramanyam D, Gurunathan D, Gaayathri R, Vishnu Priya V. Comparative evaluation of salivary

malondialdehyde levels as a marker of lipid peroxidation in early childhood caries. Eur J Dent. 2018 Jan;12(1):67–70.

23. Jeevanandan G, Thomas E. Volumetric analysis of hand, reciprocating and rotary instrumentation techniques in primary molars using spiral computed tomography: An in vitro comparative study. Eur J Dent. 2018 Jan;12(1):21–6.

24. Ponnulakshmi R, Shyamaladevi B, Vijayalakshmi P, Selvaraj J. In silico and in vivo analysis to identify the antidiabetic activity of beta sitosterol in adipose tissue of high fat diet and sucrose induced type-2 diabetic experimental rats. Toxicol Mech Methods. 2019 May;29(4):276–90.

25. Sundaram R, Nandhakumar E, Haseena Banu H. Hesperidin, a citrus flavonoid ameliorates hyperglycemia by regulating key enzymes of carbohydrate metabolism in streptozotocin-induced diabetic rats. Toxicol Mech Methods. 2019 Nov;29(9):644–53.

26. Alsawalha M, Rao CV, Al-Subaie AM, Haque SKM, Veeraraghavan VP, Surapaneni KM. Novel mathematical modelling of Saudi Arabian natural diatomite clay. Mater Res Express. 2019 Sep 4;6(10):105531.

27. Yu J, Li M, Zhan D, Shi C, Fang L, Ban C, et al. Inhibitory effects of triterpenoid betulin on inflammatory mediators inducible nitric oxide synthase, cyclooxygenase-2, tumor necrosis factor-alpha, interleukin-6, and proliferating cell nuclear antigen in 1, 2-dimethylhydrazine-induced rat colon carcinogenesis. Pharmacogn Mag. 2020;16(72):836.

28. Shree KH, Hema Shree K, Ramani P, Herald Sherlin, Sukumaran G, Jeyaraj G, et al. Saliva as a Diagnostic Tool in Oral Squamous Cell Carcinoma – a Systematic Review with Meta Analysis [Internet]. Vol. 25, Pathology & Oncology Research. 2019. p. 447–53. Available from: http://dx.doi.org/10.1007/s12253-019-00588-2

29. Zafar A, Sherlin HJ, Jayaraj G, Ramani P, Don KR, Santhanam A. Diagnostic utility of touch imprint cytology for intraoperative assessment of surgical margins and sentinel lymph nodes in oral squamous cell carcinoma patients using four different cytological stains. Diagn Cytopathol. 2020 Feb;48(2):101–10.

30. Karunagaran M, Murali P, Palaniappan V, Sivapathasundharam B. Expression and distribution pattern of podoplanin in oral submucous fibrosis with varying degrees of dysplasia – an immunohistochemical study [Internet]. Vol. 42, Journal of Histotechnology. 2019. p. 80–6. Available from: http://dx.doi.org/10.1080/01478885.2019.1594543

31. Sarode SC, Gondivkar S, Gadbail A, Sarode GS, Yuwanati M. Oral submucous fibrosis and heterogeneity in outcome measures: a critical viewpoint. Future Oncol. 2021 Jun;17(17):2123–6.

32. Raj Preeth D, Saravanan S, Shairam M, Selvakumar N, Selestin Raja I, Dhanasekaran A, et al. Bioactive Zinc(II) complex incorporated PCL/gelatin electrospun nanofiber enhanced bone tissue regeneration. Eur J Pharm Sci. 2021 May 1;160:105768.

33. Prithiviraj N, Yang GE, Thangavelu L, Yan J. Anticancer Compounds From Starfish Regenerating Tissues and Their Antioxidant Properties on Human Oral Epidermoid Carcinoma KB Cells. In: PANCREAS. LIPPINCOTT WILLIAMS & WILKINS TWO COMMERCE SQ, 2001 MARKET ST, PHILADELPHIA …; 2020. p. 155–6.

34. Garn SM, Cole PE, Smith BH. The effect of sample size on crown size asymmetry. J Dent Res. 1979 Oct;58(10):2012.

35. Plavcan JM, Michael Plavcan J. Sexual dimorphism in primate evolution [Internet]. Vol. 116, American Journal of Physical Anthropology. 2001. p. 25–53. Available from: http://dx.doi.org/10.1002/ajpa.10011

36. Hattab FN, al-Khateeb S, Sultan I. Mesiodistal crown diameters of permanent teeth in Jordanians. Arch Oral Biol. 1996 Jul;41(7):641–5.

37. Karaman F. Use of Diagonal Teeth Measurements in Predicting Gender in a Turkish Population* [Internet]. Vol. 51, Journal of Forensic Sciences. 2006. p. 630–5. Available from: http://dx.doi.org/10.1111/j.1556-4029.2006.00133.x

38. Elangovan A, Mungara J, Joseph E, Guptha V. Prevalence of dentofacial abnormalities in children and adolescents with β-thalassaemia major. Indian J Dent Res. 2013 Jul;24(4):406–10.

39. Acharya AB, Mainali S. Sex Discrimination Potential of Buccolingual and Mesiodistal Tooth Dimensions [Internet]. Vol. 53, Journal of Forensic Sciences. 2008. p. 790–2. Available from: http://dx.doi.org/10.1111/j.1556-4029.2008.00778.x

40. Yuen KKW, So LLY, Tang ELK. Mesiodistal crown diameters of the primary and permanent teeth in Southern Chinese--a longitudinal study [Internet]. Vol. 19, The European Journal of Orthodontics. 1997. p. 721–31. Available from: http://dx.doi.org/10.1093/ejo/19.6.721