

Role of Mandibular Canine in Sex Determination of Palamau Region Population

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ABSTRACT

Background: The study was conducted on the student of Vananchal dental college and hospital, Garhwa (Jharkhand) to find the role of mandibular canine in sex determination. The sample consisted of 350 patients in the adult age group of 17 to 24 years. The impressions of the mandibular teeth were made using alginate impression material and cast model was prepared using dental stone. Digital Vernier caliper was used to measure the maximum mesiodistal diameter of permanent right and left canine and the linear distance between tips of both mandibular canines. Data obtained was compiled on a MS Office Excel Sheet (v 2010) and was subjected to statistical analysis using Statistical package for social sciences (SPSS v 21.0, IBM). Inter group comparison i.e. comparison between males & females has been done using the test. There was a statistically highly significant difference seen with comparison of all 3 variables like between males & females ($p < 0.01$), with higher values for males as compared to females for all the 3 variables.

Keywords: Mandibular canine, Sex determination.

INTRODUCTION

Teeth are an excellent material in living and non-living populations for anthropological, genetic, odontologic and forensic investigations. Teeth are the most indestructible part of the body and exhibit the least turnover of natural structure. Hence, teeth can be identified even when the rest of the body has undergone decomposition; especially for identification on fragmentary adult skeleton. "Sexual Dimorphism" refers to those differences in size, stature and appearance between male and female that can be applied to dental identification because no two mouths are alike. Teeth are readily accessible for examination and since no two teeth have similar morphology, they form an excellent forensic tool for sex determination. The identification of sex is of significance in case of major disasters where bodies are often damaged

beyond recognition. Gender determination of skeletal remains is a part of archaeological and many medico-legal examinations. The methods vary and depend on the available bones and their condition. The only method that can give a totally accurate result is the DNA technique, but in many cases for several reasons it cannot be used. Anthropological measurements of the skeleton and the comparison with existing standard data must then be applied and may help existing standard data must then be applied and may help individual basis however, gender differences are not always distinctive, when taken collectively they can give a good indication in the majority of cases. Mesiodistal diameter of mandibular and maxillary canines provides evidence of sex determination due to dimorphism. Mandibular canines especially are

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found to exhibit the greatest sexual dimorphism amongst all teeth.[1 2] Migration is a global phenomenon. With the global economy being opened up, huge opportunities have come up for trans-national and intra-national migration, wherein people try to capitalize on the best available economic opportunities, irrespective of geographic distance or boundaries. Jharkhand, due to its high rate of industrial and economic growth is one of those states of the Indian union which has experienced one of the greatest incidences of internal migration. This phenomenon encompasses people of all skill levels, from the highly qualified to those engaged in manual labour. Palamau, in Jharkhand, has always been a cosmopolitan city, being home to a large population of migrants from other states of India. [2] Teeth are amongst the hardest and chemically stable tissues in the body, rendering themselves amenable to both medico-legal and archaeological investigations, in both of which, identification of the dento-osseous remains is of paramount importance. Amongst all teeth, Mandibular Canine shows the greatest variation in dimensions between the sexes, a phenomenon known as sexual dimorphism[2,3] This can be immensely beneficial to the forensic investigator for the purposes of both investigation as well as identification, as it significantly narrows down the possibilities, as far as the probable perpetrators and/or victims are concerned.[4] Sex identification is an absolute necessity in cases of suicide, homicide, mass casualties (both man made or natural), and a tooth which shows obvious sexual dimorphism can be a useful means of personal identification, especially where there has been extensive decomposition or destruction of facial soft tissue features. When personal photo identification cards like "Aadhaar" are being issued, which include biometric details like fingerprint patterns and retinal scans, a case can be made for such future cards to include odontometric details too. This would aid in personal identification in cases of forensic investigations or other medico-legal situations

Aim and objectives

- To determine and compare cervico-incisal heights and mesio-distal widths of both Mandibular canines of the Palamau and non-Palamau subjects under study.

- To establish that the dimorphism (crown width) of canine can be used for sex determination.
- To establish that mandibular canines is a quick, easy, reliable and reproducible method of sex determination.
- To use this method as a forensic tool in gender determination as dental tissues are stable.
- To determine extent of sexual dimorphism, as shown by Mandibular canine measurements, amongst Palamau population under study.
- To determine extent of sexual dimorphism, as shown by Mandibular canine measurements, amongst non-Palamau population under study.
- To compare sexual dimorphism of Mandibular canines between Palamau and Non-Palamau populations of the subjects under study.

MATERIALS AND METHODS

The Present study was conducted on 350 adult students (350 subjects 175 males and 175 females) age groups of 17 to 24 years were selected as attrition is minimal in this age group. The study was conducted on the student of Vananchal dental college and hospital garhwa (Jharkhand). The impressions of the mandibular teeth will be made using alginate impression material and cast model will be prepared using dental stone. Digital Vernier caliper will be used to measure the maximum mesiodistal diameter of permanent right and left canine and the linear distance between tips of both mandibular canines. The study was statically analyzed by t-test The data for this study were obtained from permanent mandibular right and left canine measurements. The sample consisted of 350 patients in the adult age group of 17 to 24 years. Palamau population who meet the inclusion and exclusion criteria srlected for this study. The inclusion and exclusion criteria for the subjects were as follows. Inclusion Criteria:

- Healthy state of gingival and periodontium condition.
- Caries free teeth.
- Absence of spacing in the anterior teeth.
- over jet and over bite.
- Normal molar and canine relationship.

Methodology

The measurement divided into two groups .Group A taken as male and group B taken as female, according to our work there are two methods–

Mandibular canines index –

- Observed mandibular canine index
- Standard mandibular canine index.

Sexual dimorphism

Method

With the help of sliding caliper and flexible steel tape the following measurements were taken to the nearest millimeter.

Right Mandibular Canine Width

Maximum width of a right canine is measured from distal margin of canine to mesial surface of canine.

Left Mandibular Canine Width

Maximum width of a left canine is measured from distal margin of canine to mesial surface of canine. Both the canines width taken

- Intra orally
- On the cast of same subject.

Inter canine Distance

Maximum intercanine distance is measured from the tip of right canine to tip of left canine in lower jaw. Inter canine distance are taken

- Intra orally
- On the cast of same subject.

Mandibular canine index = Mesiodistal crown width of mandibular canines, intercanines, intercanines distance

RESULTS

The study was conducted on 350 adult students (350 subjects 175 males and 175 females) age groups of 17 to 24 years were selected as attrition is minimal in this age group. The study was conducted on the student of Vananchal dental college and hospital garhwa (Jharkhand). The impressions of the mandibular teeth will be made using alginate

Table 1: Age Distribution.

Number Patient	Minimum Age	Maximum Age	Mean	Std. Deviation
350	17	24	21.29	2.320

Table 2: Showing Std. Deviation and Std. Error Mean

Measurement Surface	Gender	Number of Patient	Mean	Std. Deviation	Std. Error Mean
Mesio-Distal Left	Male	175	6.59	0.341	0.026
	Female	175	5.92	0.493	0.037
Mesio-Distal Right	Male	175	6.68	0.352	0.027
	Female	175	5.96	0.479	0.036
Inter- Canine	Male	175	26.734	2.100	0.1588
	Female	175	22.30	2.137	0.1616

Table 3: Showing P value and Mean difference.

Measurement Surface	t-stat	Df	P Value	Mean Difference
Mesio-Distal Left	14.617	346	0.000	0.664
Mesio-Distal Right	16.039	346	0.000	0.725
Inter- Canine	18.552	346	0.000	4.203

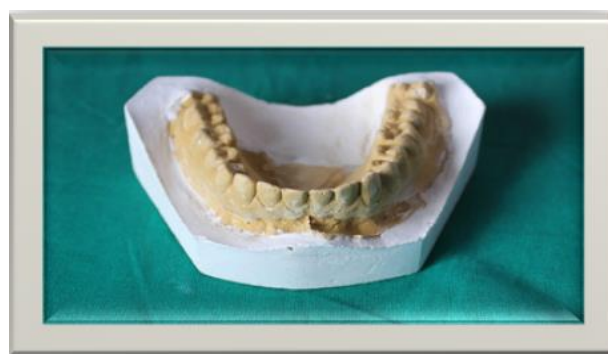


Fig 1: Study Cast.



Fig 2: Measurement of Inter-Canine Distance.

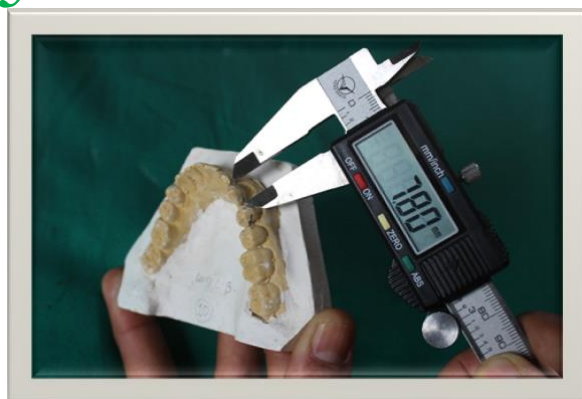


Fig 3: Measurement of Mesio-distal width of right permanent mandibular canine.

impression material and cast model will be prepared using dental stone. Digital Vernier caliper was used to measure the maximum mesiodistal diameter of permanent right and left canine and the linear distance between tips of both mandibular canines.(Figure-1)

Statistical procedures

Data obtained was compiled on a MS Office Excel Sheet (v 2010) and was subjected to statistical analysis using Statistical package for social sciences (SPSS v 21.0, IBM). Inter group comparison i.e. comparison between males & females has been done using t test. For all the statistical tests, $p < 0.05$ was considered to be statistically significant, keeping α error at 5% and β error at 20%, thus giving a power to the study as 80%.

The age range was taken 17 years to 24 years.(Table-1) The N value is 350, The Mean age is 21.29. The standard deviation is 2.320. There is no significant differences seen among different age group in all variables taken i.e Mesio-distal diameter of right permanent mandibular canine,

mesio distal diameter of left permanent mandibular canine, and inter canine distance of mandible. Out of 350 patients 175 are male and 175 are female patient. When compared to three variables i.e Mesio-distal diameter of right permanent mandibular canine, mesio-distal diameter of left permanent mandibular canine, and inter canine distance of mandible. There was a statistically highly significant difference seen with comparison of all 3 variables like between males & females ($p < 0.01$) with higher values for males as compared to females for all the 3 variables. (Table-2)

DISCUSSION

In the study done by R. C. Pramod et al (2015) total 200 subjects (100 male and 100 female) between the age group of 18-25 years were included. In their study Males showed greater mean mesio-distal dimensions for each tooth in comparison to females in both maxillary and mandibular arches. The mean values of maxillary canine widths in males and females on the right and left sides were compared using t-test and were found to be statistically significant ($P < 0.0001$). (Table-3) Similar to our study the mean value was greater in males as compared to females. The findings were similar in case of mandibular canine index. When the level of accuracy for sex determination was measured using maxillary canine index it was found that 55% females and 60% males were classified correctly. The level of accuracy for sex determination using mandibular canine index found 67% females and 78% males were classified correctly.[1]

The study Sharma M et al (2010) was conducted on 177 dental casts obtained from volunteers at random in age group 17-50 years in the department of Forensic Medicine, Govt. Medical College, Patiala and the study was completed in the department of Forensic Medicine at Gian Sagar Medical College, district Patiala. Maxillary and Mandibular impressions of all the samples were made with alginate and study models prepared in dental stone. Canines of both jaws were studied. Following measurements were taken for all the subjects using digital vernier calipers with resolution of 0.02mm. The mesio-distal diameter of canines (canine width) of right and left canines was measured for Mandibular canines, mesio-distal diameter of right side (with p-value 7.27045 E-07 and t-stat 5.208) and left side (with p-value 1E-07 and t-stat 5.642) in males and females of age group 17-30 yr showed a statistically significant difference similar to our study. Canine index in mandibular canines also did not show any significant difference. In comparison to this study our study showed significant canine index.[5]

The study by S Kausal et al (2003) Sixty subjects, 30 males and 30 females in the age group of 17-21 years were selected for the study. This age group was selected, as attrition is minimal in this age group. The study was conducted on the students of Government Medical College, Patiala. It was seen

that a definite statistically significant sexual dimorphism exists in the mandibular canines whether measurements are taken intraorally or on casts. Out of the two canines, the left one exhibits greater sexual dimorphism as compared with the right one. It is also concluded that whenever the width of either canine is >7mm the probability of sex being male is 100%. While if it is < 0.001). MCI values of males were greater than that of females and the difference was statistically significant. [5]

CONCLUSION

Teeth are an excellent material in living and nonliving populations for anthropological, genetic, odontologic and forensic investigations. These exhibit the least turnover of natural structure and are readily accessible for examination. Tooth size standards based on odontometric investigations can be used in age and sex determination. In present study the significant results are obtained on comparison of right and left mandibular canine indices in males and females justify its usage as a tool for the determination of sex of an individual. The findings indicate that the dimorphism in mandibular canines can be immense medico legal use in gender identification.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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