Asian Pac. J. Health Sci., **2016; 3 (4):171-175** **e-ISSN: 2349-0659, p-ISSN: 2350-0964**

Document heading **doi: 10.21276/apjhs.2016.3.4.27** **Research Article**

Sex Determination by means of Inter-Canine and Inter-Molar Width- A Study in Telangana population

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ABSTRACT

Background: Teeth have been used for identification of individuals and sex determination as they are resistant to various insults.**ims and Objectives:** To determine the role of inter-canine and inter-molar width in identification of sex of individuals. **Materials and Methods:** 50 subjects were included in the study. Impressions were taken with alginate and study models prepared. Inter canine and inter molar width was measured in all the cases and findings tabulated. **Results:** Inter canine and inter molar width for males were higher than females in both maxilla and mandible. **Conclusion:** inter-canine and inter-molar widths can be used as a tool in sex determination.

Key words: Maxillary arch, Mandibular arch, Inter-canine arch width, Inter-molar arch width, Gender, Medicolegal case.

Introduction

Gender recognition forms a part of medico-legal as well as archaeological aspects. Determination of gender can be done in various ways. This is mainly necessary in mass disasters like tsunami, earthquakes, cyclones etc. Odontometric characteristics have a major role in sex determination in such situations, especially where only small skeletal fragments like jaw are available, particularly with teeth in it.[1, 2]

Studies have proven that no two oral cavities are alike and similar to fingerprints, odontometric measurements are also unique and can be used for sex identification. The main rationale teeth are used in medico-legal cases is the fact that they are the hardest structures in human body and hence are resistant to various types of insults that may occur in mass disasters. Hence, teeth make up a valuable tool in various forensic studies. Odontometric studies have been used in the past for personal identification which include the age and sex of the individuals.[3, 4]

Sexual dimorphism term denotes differentiating males and females by means of differences in size, stature and morphology of the individuals. Canines have been proven to have greatest sexual dimorphism, making them very valuable. The various measurements used in previous studies for sexual identification by canines are mesio-distal width of canine, inter-canine width and mandibular canine index.[3-5]

Recently first molars have been used for gender determination. This is due to the fact that these are first permanent teeth to erupt in both the arches, are very rarely impacted and especially in cases where canines are impacted or missing. Few studies have been carried out to apply inter-molar width as a tool to identify sex of an individual.[3-6]

Here we carried out a study for sex determination in Telangana state population by using inter-canine and inter-molar widths.

Aims and Objectives

1. To find out the inter-canine and inter-molar arch width in the maxillary and mandibular arches.

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2. To appraise the usefulness of inter-canine and inter-molar arch width in sex identification.
3.

Materials and Methods

50 subjects were included in our study, out of which 25 were males and 25 females

Inclusion Criteria:

1. Ages between 17 and 25
2. No spacing between teeth
3. No inclination, caries, missing of teeth
4. Normal canine and molar relationships

Exclusion Criteria:

1. Patients with overjet and overbite
2. Patients with impacted canines
3. Patients with broken or attrited teeth
4. Patients with abnormal habits

Once the patients were selected for the study, they were explained orally regarding the study and after their voluntary approval, a written consent was taken from all of them. The patient was seated comfortably and following aseptic conditions and wearing gloves, upper and lower jaw impressions were taken with alginate impression material using universal precautions for infection control. The study cast models of these impressions were prepared with dental stone and were used for analysis of odontometric values (**Fig 1**).

Fig 1: Arnamentarium

Vernier callipers was used to measure the following measurements in both upper and lower jaw study models,

1. Inter-canine width - from cusp tip of canine of one side of arch to the cusp tip of canine on another side of same arch.
2. Inter-molar width - from central fossa of first molar of one side of arch to the central fossa of first molar on another side of same arch.

Finally all the 4 measurements of each of 50 subjects i,e maxillary inter-canine width, maxillary inter-molar width, mandibular inter-canine width and mandibular inter-molar width (**Fig 2-5**).

Fig 2 :Inter-canine distance in upper jaw

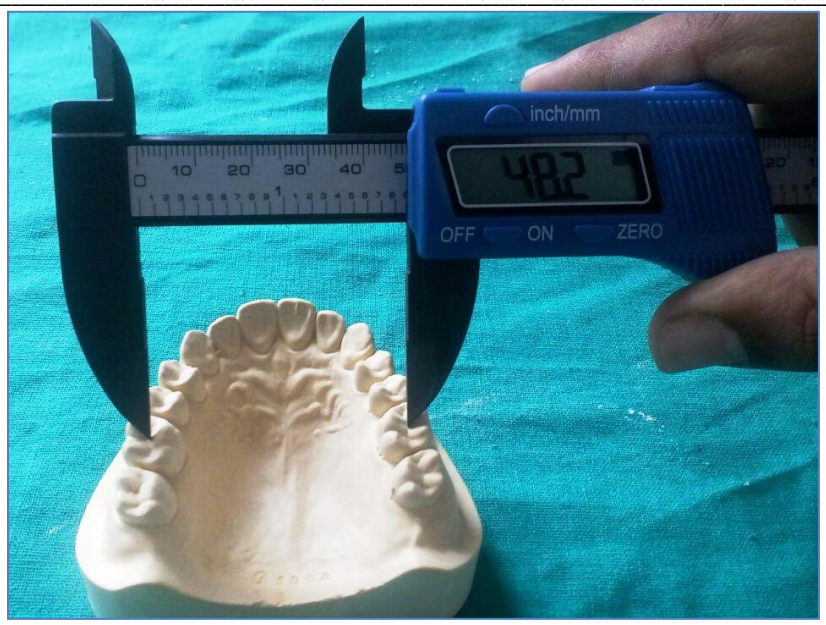

Fig 3: inter- molar distance in upper jaw

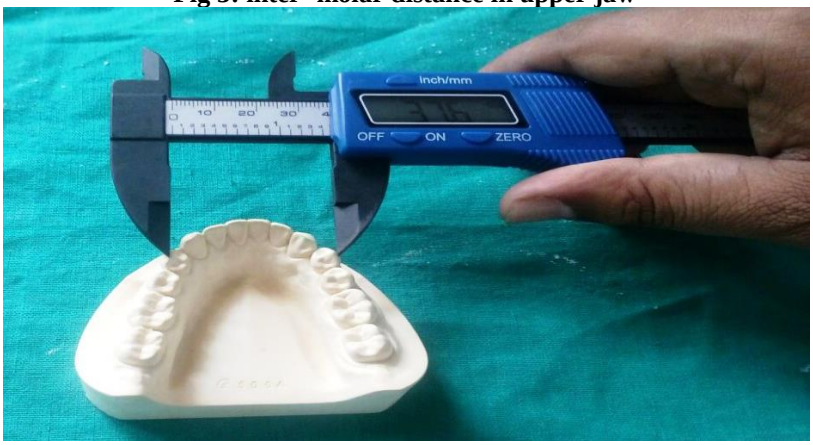

Fig 4: inter-canine distance in lower jaw

Fig 5: inter-molar distance in lower jaw

Results

We calculated arithmetic means for both inter-canine and inter-molar arch width in both the arches (maxillary and mandibular) for males and females. To compare the means of the inter-canine and inter-molar width in maxillary and mandibular arches for males and females, student't' test was used. We found the comparison values to be significant with 'p' value < 0.05.

The results are tabulated as follows

1. **Inter-canine width in maxillary arch** for male and female subjects was found to be 35.08 ± 1.47 and 33.42 ± 1.53 respectively with 't' value being 3.91 (**Table 1**).
2. **Inter-molar width in maxillary arch** for male and female subjects was found to be 47.37 ± 1.69 and 44.29 ± 1.65 respectively with't' value being 6.52 (**Table 1**).

Table 1: Statistical Significance of Different Parameters of Maxilla

Parameters	Sex	Mean	±S.D	't' value	'p' value	Significance
Inter- Canine Width	M	35.08	1.47	3.91	0.00	Significant
	F	33.42	1.53			
Inter-Molar Width	M	47.37	1.69	6.52	0.00	Significant
	F	44.29	1.65			

3. **Inter-canine width in mandibular arch** for male and female subjects was found to be 26.77 ± 1.45 and 26.43 ± 1.60 respectively with 't' value being 0.78 (**Table 2**).
4. **Inter-molar width in mandibular arch** for male and female subjects was found to be 41.67 ± 1.96 and 38.06 ± 1.82 respectively with 't' value being 6.86 (**Table 2**).

Table 2: Statistical Significance of Different Parameters of Mandible

Parameters	Sex	Mean	±S.D	't' value	'p' value	Significance
Inter- Canine Width	M	26.77	1.45	0.78	0.21	Significant
	F	26.43	1.60			
Inter-Molar Width	M	41.67	1.96	6.86	0.00	Significant
	F	38.06	1.82			

Discussion

Now a days we are experiencing more and more disasters which are taking thousands of lives, as these occur suddenly and with great magnitude, thereby causing considerable damage. These can be broadly classified in to two categories, natural and man-made disasters. Natural calamities include earthquakes, floods etc., whereas man-made calamities include wars, riots etc. In these circumstances, there arises a need to precisely recognize the remains of dead persons. Personal identification depends on various factors like age, sex and race. Identification of sex is one of the most vital steps in use for identification of an person. The advantage of determining sex in mass disasters is that accurately determined gender limits the number of missing persons to one half of the population in most cases.[1, 5, 6]

In mass disasters, forensic experts in many cases recover partial remains like fragmented skull, jaws and other bones of the body. It has been proved that teeth are one of the strongest tissues in human body that can resist a variety of ante-mortem and post-mortem insults and also teeth are one of the most frequently recovered remains. Many studies have used mesio-distal width of canine, inter-canine width and mandibular canine index (MCI) to establish sex of an individual.[1-4] But some recent studies by Acharya et al[5, 6], and Boaz et al[7] have found that these dimensions do not reveal the gender differences precisely.

But in patients with missing canines, these measurements are not helpful. Hence, in such individuals, mesio-distal width of molars and inter-molar arch width can be used in sex identification. Therefore in our study inter-molar arch width was also measured and was used to determine the gender and the observed results were then compared with inter-canine

arch width, thereby assessing a better method to establish gender accurately. We found that the mean inter-canine width in maxilla and the mean inter-molar width in both maxilla and mandible were significantly higher in males than females.[8]

Our results are in accordance with other previous studies, which have also observed males have wider teeth and larger inter canine and inter molar width than girls. This findings might be due to fact that dental arch width reflects the size of the basal bone and because males in general have larger basal bones than females, the same might be applicable to the basal bone of the jaws and the dental arches.[9, 11]

The mean mandibular inter-canine width between males and females in our study was statistically insignificant. Our results are in agreement with other earlier studies, This findings might be due to the crowding more common in mandibular anteriors, which is likely to decrease the anterior dental arch width. Our observations are in contrast to that of Hussein et al.[9]

When compared, the maxillary inter-canine and mandibular inter-molar arch width were found to have high 't' values, and were found to be rather helpful in identification of gender. This finding might be due to considerable variation in the arch width between both genders.[9-11]

Conclusion

We carried out odontometric study in 50 subjects to identify gender. We conclude that inter-canine and inter-molar width can be used as a tool for identifying sex. We suggest that inter-molar arch width may be helpful in determining the sex accurately, especially in cases where canines are absent. We found that inter-molar width is more precise in sex identification than inter-canine arch width, with maxillary inter-molar arch width being more specific.

Source of Support: Nil
Conflict of Interest: None

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