GENDER DETERMINATION USING INTERCONDYLAR DISTANCE OF MANDIBLE

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Abstract:
Introduction: Gender variations in the human skull have long been known, and they are both anatomically interesting and useful in forensic identification. Some of these distinctions are related to the mandible. These are characterised as having a more square chin in men versus a more rounded chin with a point in the middle in women. **Aim:**The aim of this study is to determine a significant difference between the mean intercondylar distances of men and women. **Materials and methods:**Around 30 dried samples of mandible Were collected from the anatomy department of Saveetha dental College. These multiple samples were collected and measured using the words the caliper on the parameters of lateral intercondylar distance, medial intercondylar distance and intercondylar distance in millimetres. The results were obtained and tabulated in the form of bar graphs.**Results:** The dimensions of intercondylar distance of mandible using the parameters mid to mid distance,lateral distance and medial distance was found effective in determining the gender of 30 mandibles. **Conclusion:**This study concludes that intercondylar distance plays an important role in gender identification in forensic dentistry.

KEYWORDS: intercondylar distance; mandible; sex determination; gender identification, innovative method

Introduction:

Forensic investigations include determining the gender of skeletal remains (1). The methods differ and are dependent on a variety of factors (1) . The only method that can provide a completely accurate result is DNA, but it cannot be used in many cases due to a variety of factors, including cost (1). Mandible is an excellent forensic material for determining sex and can be used in forensic investigations (1). After reaching puberty, sex determination becomes more precise. The variations in the bony pelvis and skull are obvious (2). Following each of these bony regions, the mandible is the next bony region in the human body, which aids in the recognition of age, sex, and race (2).Some of these distinctions are related to the mandible (1) .These are characterised

as having a more square chin in men versus a more rounded chin with a point in the middle in women (3).Men's mandibles are also said to be more durable, with stronger, more flaring gonial areas, wider rami, and solid coronoid processes(3). If the anatomic intercondylar distance (the distance between the right and left condyles on the mandible) is greater in men than in women, it can be inferred that the dynamic intercondylar distance, as calculated by the dynamic intercondylar distance, is also greater in men (3).Sex can be determined with 100 percent accuracy, but in mass disasters, where broken bones are common, 100 percent accuracy is not feasible, and sex determination is largely dependent on the available parts of the skeleton(4)(5) .

The human mandible is the largest and strongest bone in the face; it is made up of two ascending ramus, one on each side, which support the coronoid and condylar processes (6).The condyle is a rounded projection that articulates with the glenoid fossa of the temporal bone (6).Different morphological variations of the condyle (angled, round, convex and flat) have been documented in literature as indispensable aids in anthropological and forensic studies (6,7).

Previous study states that the masticatory forces exerted by males and females vary, the relative development (size, weight, and angulation) of the muscles of mastication is known to influence the development of mandibular dimorphism(4) .Measurement and morphometry-based methods are reliable and can be used to determine sex (4)(8).Other dimorphic elements related to the mandibular bone have been recorded, including the mandibular or gonial angle, ramus length, bigonial width, and bicondylar width.Cephalometric data or image analysis, along with data processing programmes, have primarily been used to investigate the morphologic features of the condyles of the mandible(9).In this study, we determined whether a sig- nificant difference exists between the mean intercondylar distances of men and women.

Materials And Methods

The study was carried out on 30 dry human skulls of known sex and age which were taken from the Department of Anatomy, Saveetha Dental College, Chennai. 15 mandible of male skull and 15 mandible of female skull was observed and collected for evaluation. Any skull bone with gross pathology or deformity were excluded from the study. The morphology of right and left intercondylar distance was examined and was measured using a digital sliding vernier caliper. The length of medial intercondylar distance, lateral intercondylar distance and mid to mid intercondylar distance was measured and noted. The data collected was then calculated to derive the determination of sex with the help of intercondylar distance . The obtained intercondylar distance was represented graphically through bar chart. The sex determination through the intercondylar distance was depicted .

Figure 1: Medial intercondylar distance

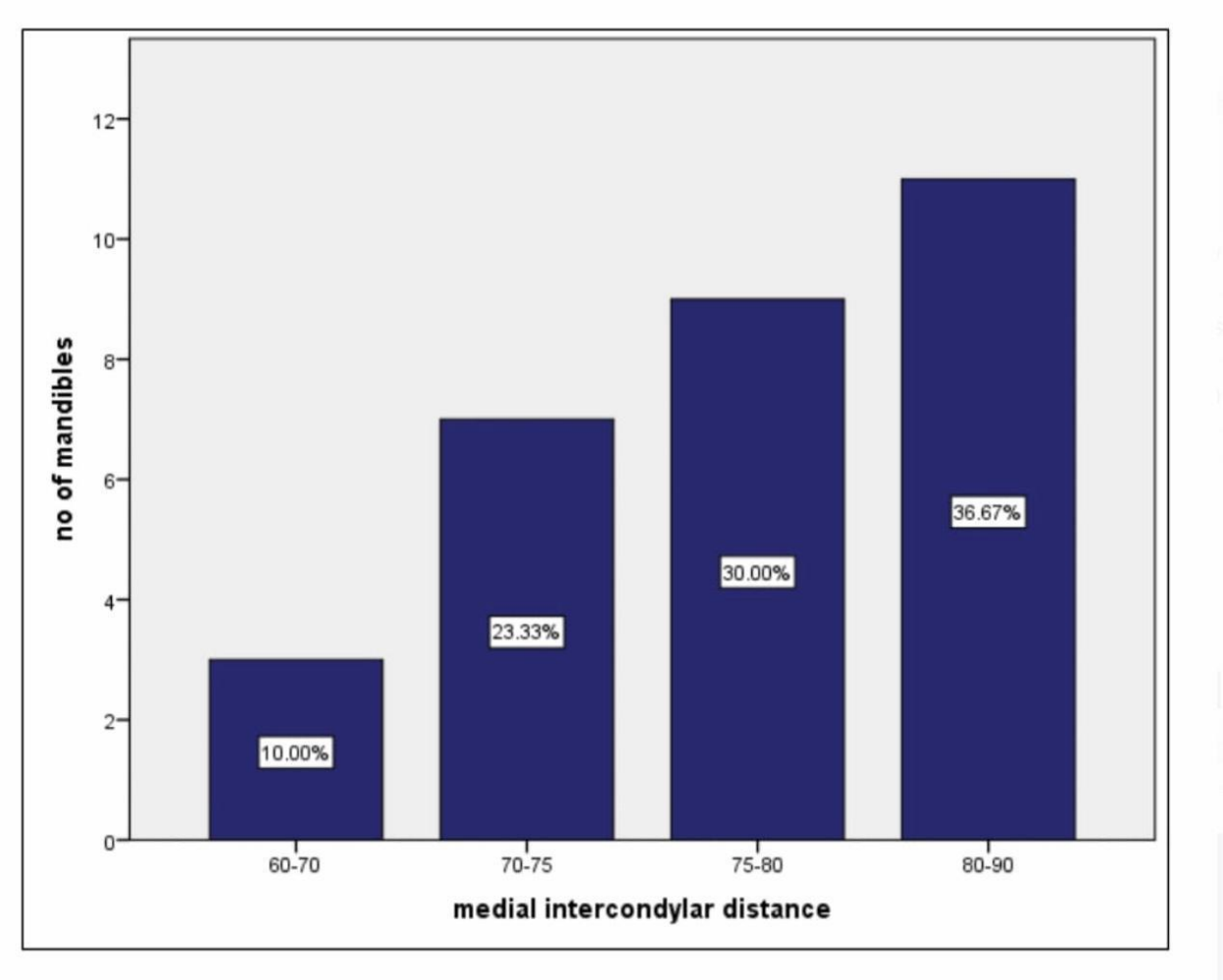
Figure 2: Lateral intercondylar distance

Figure3: Mid to mid intercondylar distance

Results:

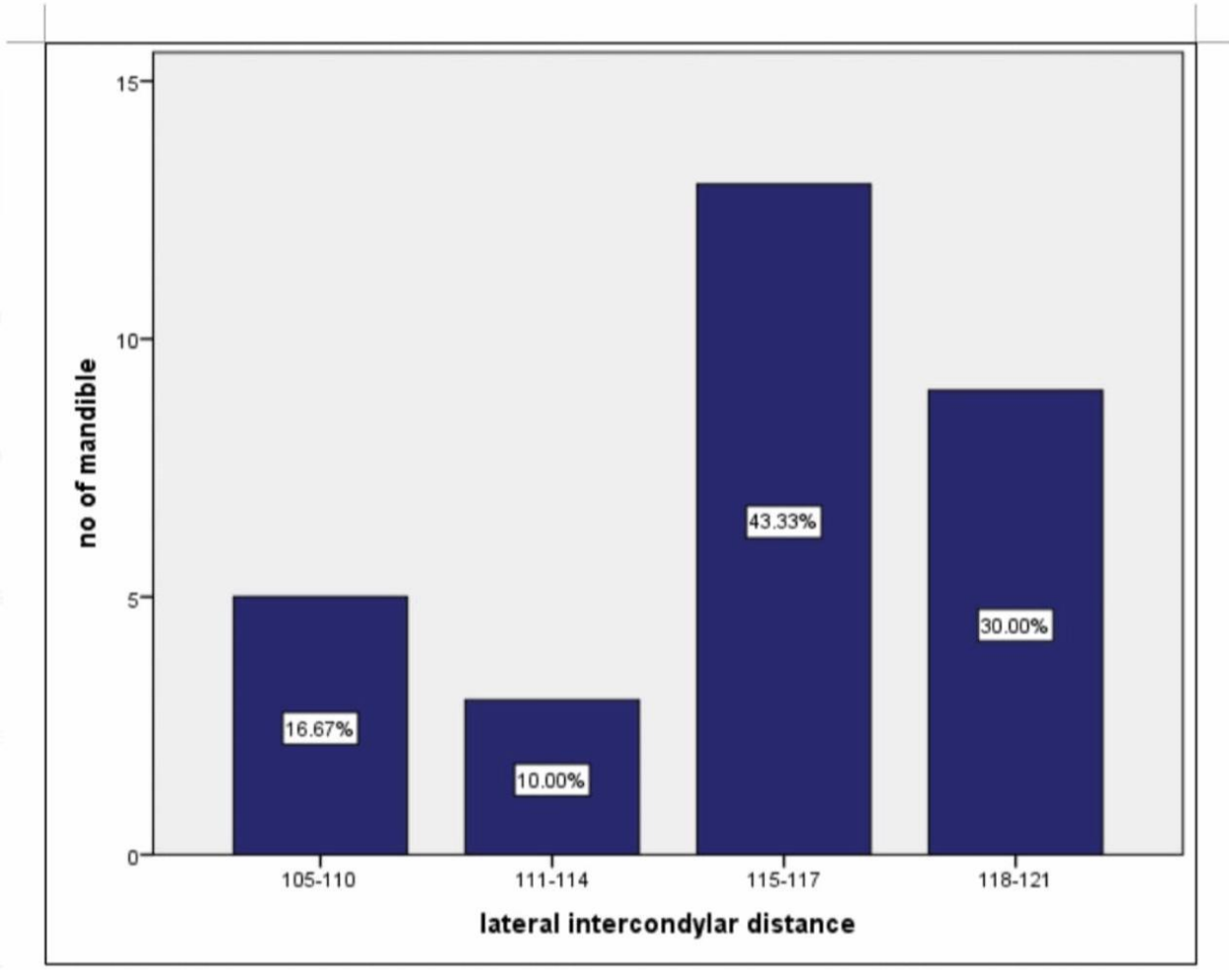
In this study we measured the medial intercondylar distance, lateral intercondylar distance and mid to mid intercondylar distance for gender identification . Majority of the mandibles showed medial intercondylar distance of 80-90 mm the percentage is 36.67% (graph 1).Majority of the mandibles showed lateral intercondylar distance of 115-117 mm the percentage is 43.33% (graph 2).Majority of the mandibles showed lateral intercondylar distance of 101-105 mm the percentage is 36.67% (graph 3).36.67% of the male mandibles were in the range between 101-105 mid to mid intercondylar distance (graph 4) .The p value is 0.25>0.05 which is statistically insignificant..36.67% of the male mandibles were in the range between 80-90 medial intercondylar distance (graph 5).the p value is 0.034<0.01 which is statistically significant.

Figure 4:



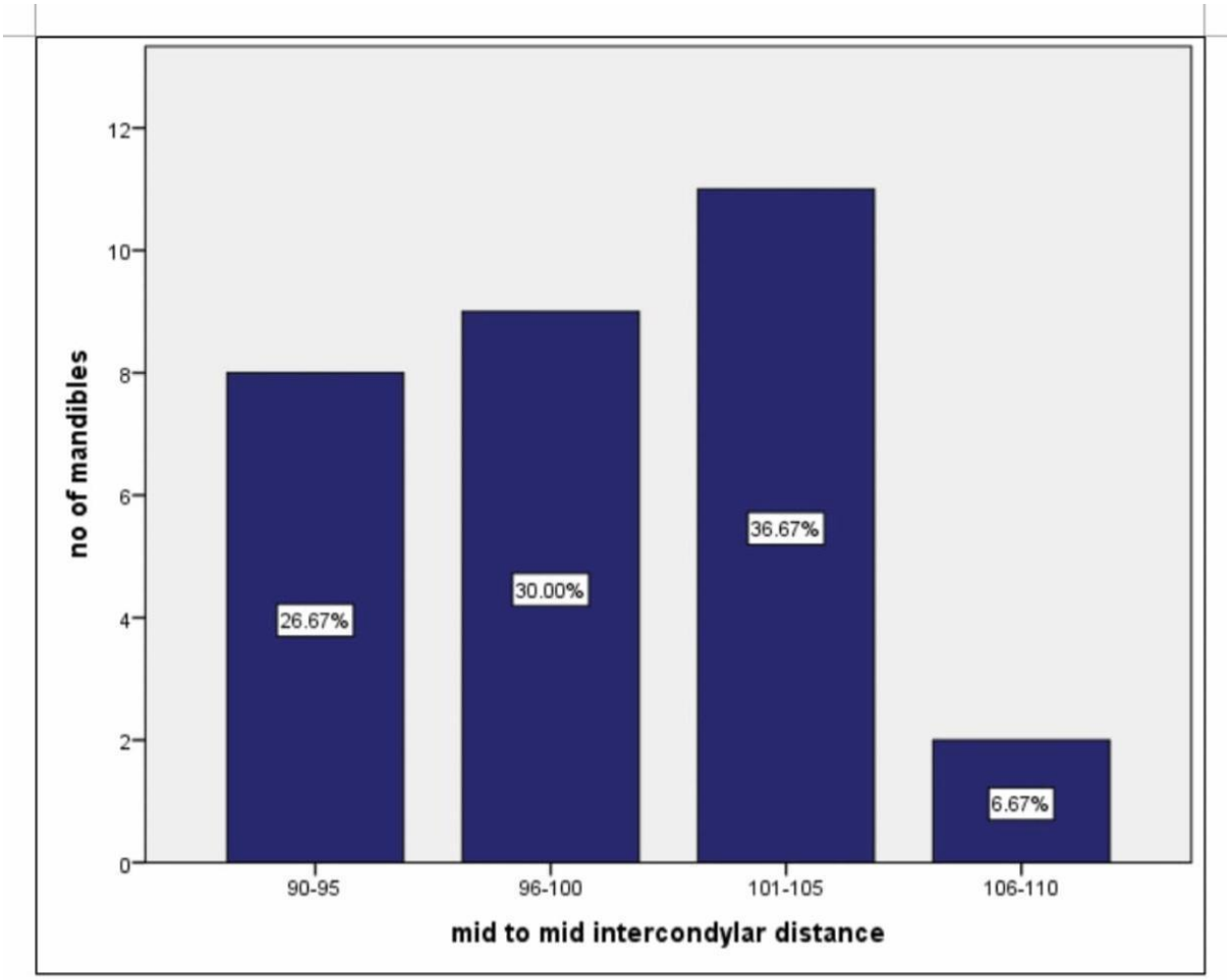
The graph represents the distance between 2 medial sides of the condyle measured in millimetres.The x axis represents the medial intercondylar distance and y axis represents the number of mandibles.Majority of the mandibles showed medial intercondylar distance of 80-90 mm the percentage is 36.67%.

Figure 5:



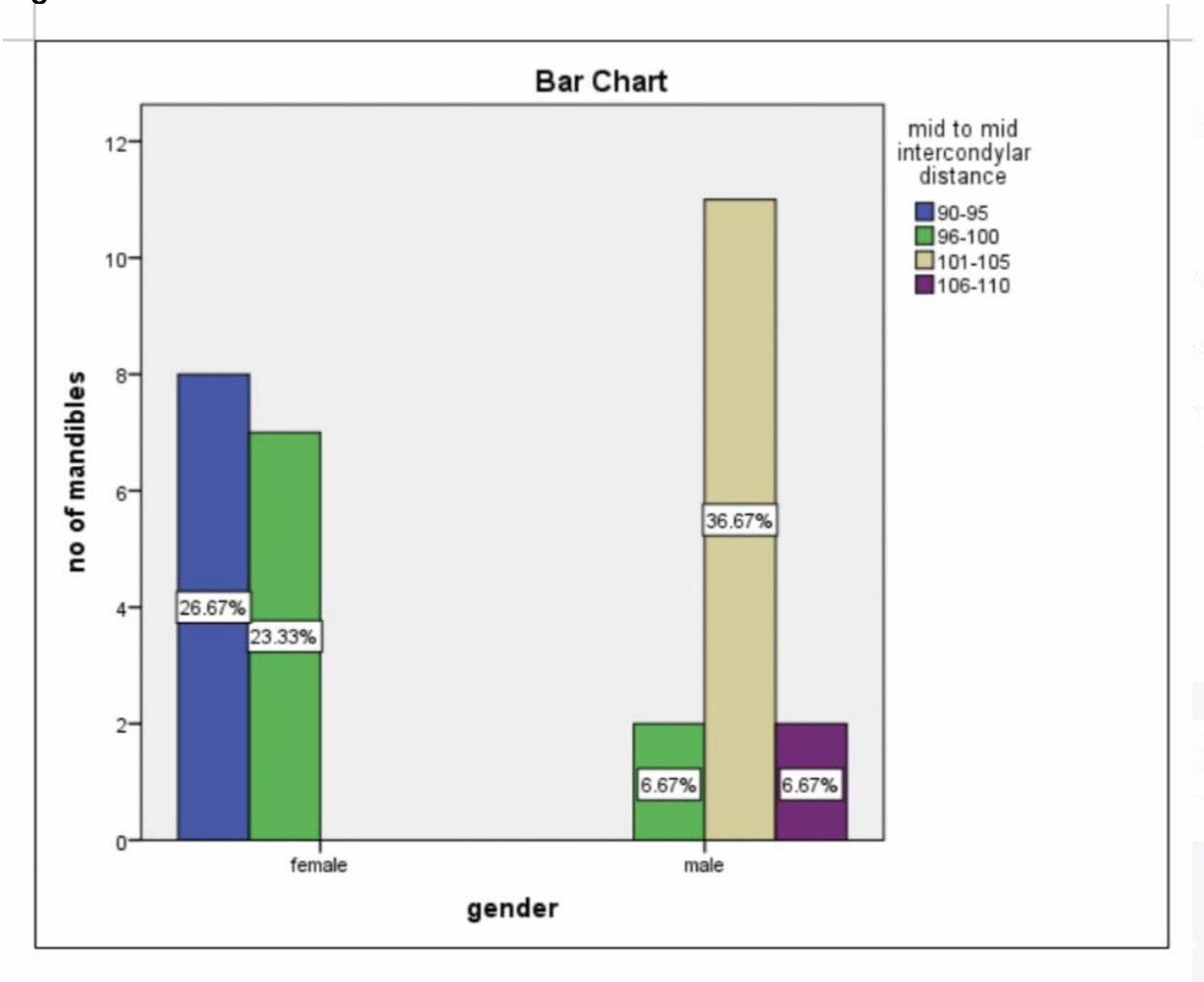
The graph represents the distance between 2 lateral sides of the condyle measured in millimetres. The x axis represents the lateral intercondylar distance and y axis represents the number of mandibles.Majority of the mandibles showed lateral intercondylar distance of 115-117 mm the percentage is 43.33%.

Figure 6:



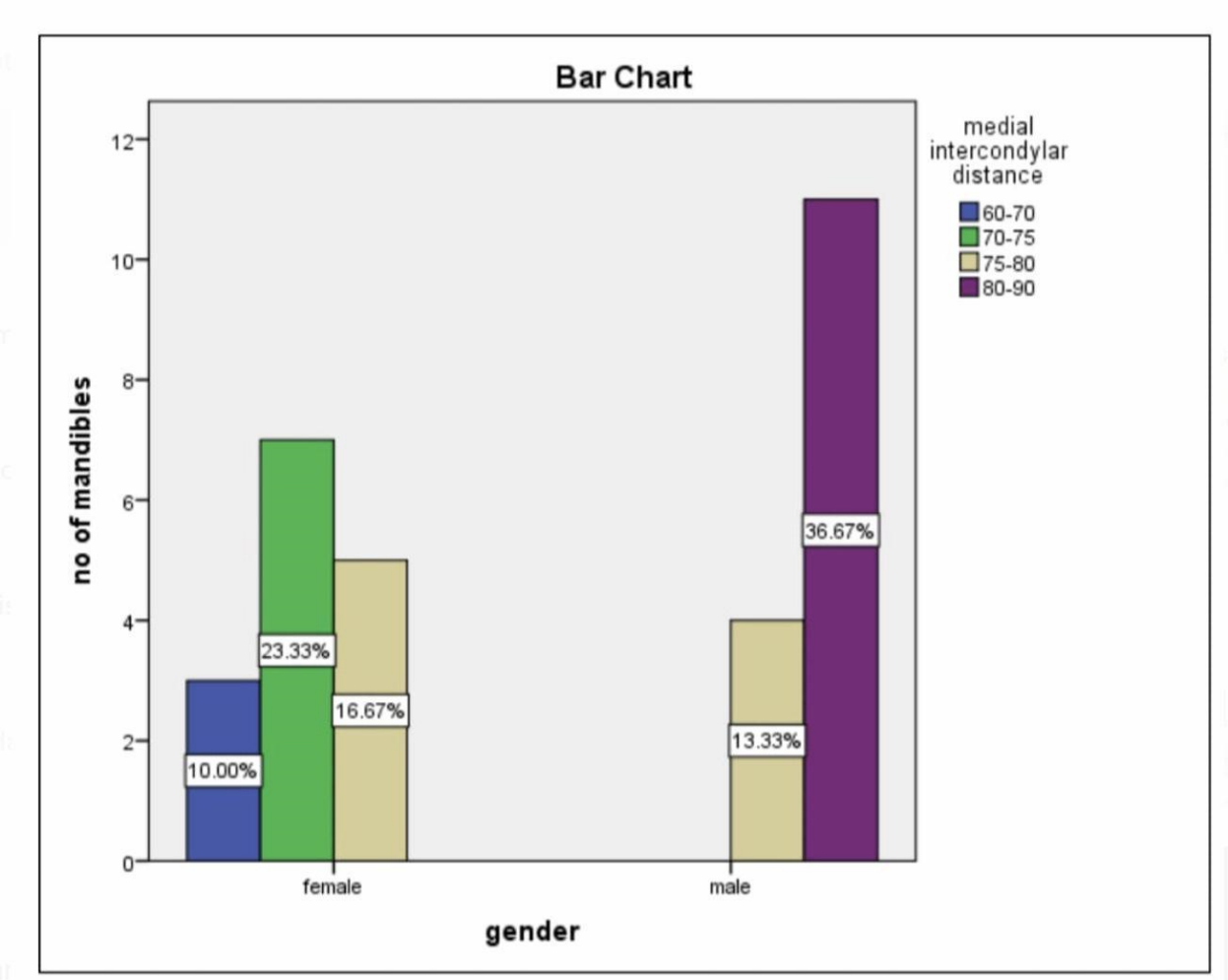
The graph represents the distance between 2 mid to mid points of condyle measured in millimetres.The x axis represents the mid to mid intercondylar distance and y axis represents the number of mandibles.Majority of the mandibles showed lateral intercondylar distance of 101-105 mm the percentage is 36.67%.

Figure 7:



Bar chart Represents the correlation between the gender and the dimensions of mid to mid intercondylar distance. The X axis denotes the gender and the Y axis denotes the no of mandibles. Blue denotes 90-95 mid to mid intercondylar distance, green represents 96-100 mid to mid intercondylar distance and yellow represents 101-105 mid to mid intercondylar distance and violet represents 106-110 mid to mid intercondylar distance. 36.67% of the male mandibles were in the range between 101-105 mid to mid intercondylar distance.The p value is 0.25>0.05 which is statistically insignificant.

Figure 8:



Graph Represents the correlation between the gender and the dimension of the length of medial intercondylar distance. The X axis denotes the gender and the Y axis denotes the no of mandibles. Blue denotes 60-70 medial intercondylar distance, green represents 70-75 medial intercondylar distance and yellow represents 75-80 medial intercondylar distance and violet represents 80-90 mid to mid intercondylar distance. 36.67% of the male mandibles were in the range between 80-90 medial intercondylar distance.the p value is 0.034<0.01 which is statistically significant.

Discussion:

By analysing the graph of present study we conclude that there is a significant difference in the length of the medial and lateral intercondylar distance among males and females . The landmarks used in this study for intercondylar distance location recognition can be easily located in living subjects.The anatomy of the condyles of the mandibles have become increasingly important in forensic odontology for gender identification . The graph (figure1) depicts that the medial intercondylar distance of men are in the range of 75-90 mm and for females the range of medial intercondylar distance is 60-75 mm.The graph (figure 2) states that lateral intercondylar distance of men are in the range of 115- 120 and for females the lateral intercondylar distance are in a range of 105-114 mm. The graph (figure 3) states that mid to mid intercondylar distance of men are of range 101-119mm and for females they are expected to be at the range of 91-100 mm.

Forensic odontology is the application of dental principles to legal issues(10,11) .Sex determination is a subset of forensic odontology, and it's crucial, particularly when there's no other details about the deceased(12). In the case of unfortunate incidents, such as chemical and nuclear weapon explosions, determining a person's sex becomes the first priority in the forensic investigator's identification process.Various methods have been used for the identification of sex. Sex determination can be done by Morphological analysis (of the tooth, skull , mandible and other soft tissues of oral and paraoral region) or molecular analysis.

The mandible is the largest and the hardest bone of the skull and a treat in shape better than the other bones in the field of forensic odontology(13).The characteristics of mandible are extremely used for determining sex(14)(12,13) . Several non matrix traits of the mandible has been associated with gender(15).

All the previous articles have stated about the different parameters of mandible i.e. the ramus , the coronoid process, gonial angle ,gonial plane,maxillary arch width are used for gender identification of male and female (11,16–18). In this study a new parameter of the mandible i.e the intercondylar distance was measured in mandibles to prove it is also an important parameter for gender identification. Limitation of this study is less sample size and homogenous population. Further research in this field is required to apply these results in a wide population.

Conclusion:

This study concludes that intercondylar distance plays an important role in gender identification in forensic dentistry.Further studies on the intercondylar distance can be carried out so that the gender identification can be done in precise manner in forensic odontology.

CONFLICT OF INTEREST: There was no conflict of interest in the present study.

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AUTHOR CONTRIBUTIONS

Author 1: A.Sabaritha, carried out the study by collecting data and drafted the manuscript after performing the necessary statistical analysis and in the preparation of the manuscript.

Author 2: Dr.Abilasha aided in conception of the topic, designing the study and supervision of the study, correction and final approval of the manuscript.

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