A Study On Sex Identification From A Finger Bone

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Abstract:-
Gender identification from dismembered parts of the human body and skeletal remains in the situations of casualties is the imperative element of the complete legal investigation in terms of medical and it is the major challenge for forensic experts. Identification of gender from fragmentary, dismembered, and mutilated human remains that get encountered in the situation of mass destruction, explosions, crashes of airplanes, homicides, criminal mutilation, assault cases, traffic accidents, and many more things, which can be very important in any kind of forensic investigation as it is the major challenge for the forensic professionals and the physical anthropologists.

The main aim of this review research is to identify the gender while utilizing the ring or index finger length ratio along with the skeletal remains for determining the crucial role of indices for establishing the identity of gender. The ring and index finger ratio was easily identified in a higher amount in females while compared with males. The results represent that there is a lot of difference in the ring and index finger length ratio among males and females. This complete review research is useful in establishing the gender within the dismembered hand while subjected to the medical examination.

Keyword: - Fingerbone, Sex, Identification, Gender, Investigation, Forensic

Introduction

Identification of sex from the fragmentary, dismembered, and mutilated human remains which gets encountered in the situation of mass destruction, explosions, crashes of airplanes, homicides, criminal mutilation, assault cases, traffic accidents, and many more things, can be a necessary part of any kind of forensic investigation as it is the major challenge for the forensic professionals and the physical anthropologists. This review research is for identifying the gender while utilizing the ring or index finger length ratio along with the skeletal remains.

Gender estimation by using the parts of the human body as well as the skeletal remains can be the necessary component of personal identification within the legal investigation related to medical terms. This review research is going to be based on the importance of finger bones associated with forensic science. This entire review research is going to illustrate the differences between the male and female finger bones. The methods of analyzing finger bones are going to be entertained on the basis of review research. Identification is going to be based on analysing the finger bones through this review research.

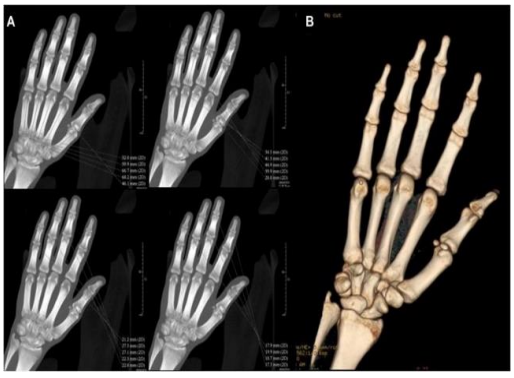

Figure 1.
(Source: www.pubmed.ncbi.nlm.nih.gov, 2023) [20]

Methodology

The methodology which is utilized in this entire review research is the qualitative methodology that is processed by analysing the records of previous years and the generated data of recent years so that the entire review research gets upgraded on behalf of sex identification using finger bone (Sarkar et. al., 2020) [17]. The analysis of the previous year's data is conducted so that it can be easily compared with the complete outcomes of the current situation as well as the changes which need to be accomplished based on complete analysis and evaluation which becomes the necessary part to keep the changes going, based on complete requirements fulfilment of the present time. This type of qualitative methodology is very easy and supportive and time-saving in conducting as well as generating the data based on the analysis of the previous records (Madgwick et. al., 2016) [12].

The particulars of forensic anthropology are introduced by using this methodology. Such as Forensic Anthropology can be stated as the special field of physical and topology which includes the application of skeletal analysis as well as the archaeological techniques for the solution of crime investigations. When the remaining skeletal suspected the discovered burials, the anthropologist initiate for gathering the information from the bones as well as the complete recovery context that needs to be determined about the person who is dead and what is the reason behind the death. Techniques that are utilized to answering the questions in an investigation which can be followed on the remains of humans for identifying their ages, gender, and the duration at which the person becomes dead. Development levels as well as growth in teeth and bones give the proper data regarding the remains which represents the information that it is of a child or an adult (EL-Galad & Saleh, 2018) [4].

Importance of finger bone

According to the study of Baryah et. al., (2019) [1], The Importance of finger bones associated with forensic science is that it also plays a significant role in identification of gender of a human body by using various types of analysis of the remaining bones of a body for identification of the age, gender, and ancestral history of the dead people. Estimation of gender by using the parts of the human body as well as the skeletal remains can be the necessary component of personal identify-cation within the legal investigation related to medical terms (Li et. al., 2017) [11]. This relates to the importance of finger bones associated with forensic science. The main difference in the male and female finger bones is that the male has a significantly large number of mean values as compared to female. The metacarpal bones and 1st as well as 3rd phalanges need to be measured through 2D images (Wilson & Jain, 2019) [19].

Dissimilarity among finger bone of male and finger bone of female

In the words of Iroanya et. al., (2020) [6], The length of a hand, length of an index finger, ring finger length, and the complete ratio of IFL versus RFL are estimated in millimetres while utilizing the sliding anthropometric Calliper. All the complete measurements were measured by the observer on the left and right hands for avoiding inter-observer biases. The complete measurement of hands was obtained by measuring the hand of a subject while kept on plain surface while facing palm in an upward direction, fingers are also expanded as well as close to each other.

The proper care was taken for avoiding the adoption or abduction in the rest joints and the forum gets directly in a linear position like the middle finger. The pelvic bone shape also gives the suitable evidence regarding the gender of an individual. The anthropologist also has the ability in identifying the skeletal clues of the ancestors' Estimation of gender by using the parts of the human body as well as the skeletal remains can be the necessary component of personal identification within the legal investigation related to medical terms. This relates to the importance of finger bones associated with forensic science. The main difference in the male and female finger bones is that the males have a significantly large number of mean values as compared to females for the distal phalanges in all the fingers (Okai et. al., 2019) [15].

The method can be used to analyse finger bone

As per the study of Datta et. al., (2018) [3], Hand length is measured for the projected distance among distal crease of a rest joint and the medial fingertip. The hand breath was also estimated, project distance among a lateral point from the bone head of secondary metacarpal with its medially placed joint which is situated on bone head of the 5th metacarpal. The index of the hand was also calculated by dividing breadth of hand by the hand length which also gets multiplied by 100. The complete index finger length is also measured with the straight distance among the metacarpal phalanges with the top of the index finger the ring finger length is also obtained by straight distance among a metacarpal creases to the type of a ring finger. Ratio of a ring and index finger can be calculated through dividing it with IFL by RFL (Hussein et. al., 2016) [5].

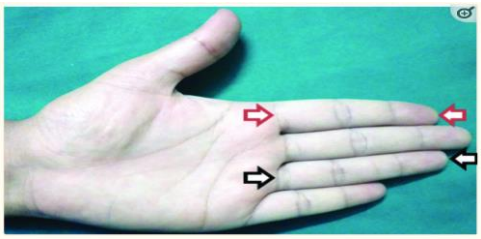

Figure 2. Landmarks of length of index finger and length of ring finger of a human hand
(Source: www.sciencedirect.com, 2023) [21]

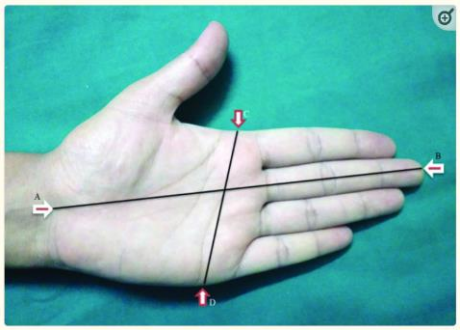

Figure 3. Landmarks of hand length and breadth of a human hand
(Source: sciencedirect.com, 2023) [21]

According to the study of Kaloi & He, (2018) [7], the Assessment of sex can be the essential step in the identification of humans relates to both Medical and legal terms. The current situation represents the applications of discriminant functioning for the unidentified skeletal remains are also getting increased constantly. Fragmentary remains of humans compromised to the various variants of an inhumations, or it may be the physical insults which may also frustrate within the utilization of the old methods of gender identification like the conducting of pelvis analysis as well as skull analysis. Estimation of gender by using the parts of the human body as well as the skeletal remains can be the necessary component of personal identification within the legal investigation related to medical terms. This relates to the importance of finger bones associated with forensic science. The main difference in the male and female finger bones is that the male have a significantly large number of mean values as compared to female. Several resources also demonstrate that because of the variations in size as well as the sexual dimorphism patterns, these prominent functional algorithms are specific with the population (Kotb et. al., 2016) [9].

Cut off values (in mm) and accuracy percentage for sex differentiation for individual bone ($N = 122$).

Bone	Cut off values	Accuracy %	Total %
Distal phalanges1	Female <21.12 < Male	Female 80% Male 66.7%	73.3%
Distal phalanges2	Female <16.49 < Male	Female 80% Male 73.3%	76.7%
Distal phalanges3	Female < 17.23 < Male	Female 66.7% Male 80%	73.3%
Distal phalanges4	Female <17.83 < Male	Female 66.7% Male 80%	73.3%
Distal phalanges5	Female <15.785 < Male	Female 86.7% Male 80%	83.3%
Middle phalanges2	Female <22.85 < Male	Female 66.7% Male 60%	63.3%
Middle phalanges3	Female <27.66 < Male	Female 66.7% Male 53.3%	60%
Middle phalanges4	Female < 26.2 < Male	Female 73.3% Male 53.3%	63.3%
Middle phalanges5	Female < 18.18 < Male	Female 60% Male 53.3%	56.7%
Proximal phalanges1	Female < 28.39 < Male	Female 53.3% Male 46.7%	50%
Proximal phalanges2	Female < 38.25 < Male	Female 53.3% Male 66.7%	60%
Proximal phalanges3	Female < 42.33 < Male	Female 53.3% Male 73.3%	63.3%
Proximal phalanges4	Female <39.29 < Male	Female 53.3% Male 66.7%	60%
Proximal phalanges5	Female < 30.82 < Male	Female 60% Male 73.3%	66.7%
Metacarpal1	Female <42.55 < Male	Female 66.7% Male 80%	73.3%
Metacarpal2	Female <64.88 < Male	Female 73.3% Male 80%	76.7%
Metacarpal3	Female < 62.5 < Male	Female 66.7% Male 73.3%	70%
Metacarpal4	Female < 54.42 < Male	Female 73.3% Male 60%	66.7%
Metacarpal5	Female <49.07 < Male	Female 73.3% Male 80%	76.7%
Metacarpal2 3D	Female <7.09 < Male	Female 100% Male 85.5%	92.9%
Metacarpal4 3D	Female <4.43 < Male	Female 57.1% Male 85.7	71.4%

Figure 4. Image represents cut off value and percentage of accuracy for the differentiation of sex for an individual bone
(Source: www.sciencedirect.com, 2023) [21]

Identification of gender in the situation of mass destruction

According to the study of Kandregula Jyothirmayi & Thaduri, (2023) [8], Forensic Anthropology can be stated as the special field

of physical and topology which includes the application of skeletal analysis as well as the archaeological techniques for finding the solution of criminal justification. Remaining skeletal of humans suspected the discovered burials, the anthropologist is initiated for gathering the information from the bones as well as the complete recovery context that needs to be determined about the person who is dead and what is the reason behind the death. Forensics and topologist usually specialize in analysing the tissues like bones, the complete training in archaeology, forensic professionals also know the excavating buried skeletons as well as the meticulous recording of the evidence.

Forensic anthropologists are able to read an evidence from a Skeleton-like reading a book. Estimation of gender by using the parts of the human body as well as the skeletal remains can be the necessary component of personal identification within the legal investigation related to medical terms. This relates to the importance of finger bones associated with forensic science. The main difference in the male and female finger bones is that the males have a significantly large number of mean values as compared to females for the distal phalanges in all the fingers (Orupabo et. al., 2020) [16].

Discussion

Determination of sex from the finger bone of skeletal remains. Apart from the various types of parameters of identification like stature, age, and race. The proper care was taken for avoiding the adoption or abduction in the rest joints and the forum gets directly in a linear position like the middle finger. The pelvic bone shape also gives the suitable evidence regarding the gender of an individual. This review research is for identifying the gender while utilizing the ring or index finger length ratio along with the skeletal remains for determining the crucial role of indices for establishing the identity of gender (Chakrabarty, 2019) [2].

Entire review research is useful in establishing the gender within the dismembered hand while subjected to the medical examination. Identification of gender from the dismembered parts of the human body and the skeletal remains in the situations of casualties are the imperative element of the complete legal investigation in terms of medical and it is the major challenge for forensic experts (Mohamed et. al., 2020) [13].

Gender estimation by using the parts of the human body as well as the skeletal remains can be the necessary component of personal identification within the legal investigation related to medical terms. The identification of gender from the fragmentary, dismembered, and mutilated human remains that get encountered in the situation of mass destruction, explosions, crashes of airplanes, homicides, criminal mutilation, assault cases, traffic accidents, and many more things, which can be very important in any kind of forensic investigation as it is the major challenge for the forensic professionals and the physical anthropologists. The results represent that there is a lot of difference in the ring and index finger length ratio among females and males. The index and ring finger ratio is easily identified in a higher amount in females while compared with males (Speller & Yang, 2016) [18].

Forensic anthropologists continuously trying in doing the methods of developments of the identification of skeletal by a complete development, using new methods and sex determination or by using of fine-tuning reliable and known and applicable methods within the several types of the parts of skeleton. The sex assessment can be a necessary part in the human identification relating to both Medical and legal terms (Nayak et. al., 2019) [14].

Conclusion

It is concluded from a review of various studies that the Importance of finger bones associated with forensic science is that it also plays a significant role in identification of gender of the human body by using various types of analysis on the remaining bones of a body for identification of the age, gender, and ancestral history of the dead people. This review research is for identifying the gender while utilizing the ring or index finger length ratio along with the skeletal remains for

determining the crucial role of indices for establishing the identity of gender. The length of a hand needs to be measured as a projected distance among its distal crease of a rest joint and the medial fingertip.

Forensic Anthropology can be stated as the special field of physical and topology which includes the application of skeletal analysis as well as the archaeological techniques for solving the criminal offense issues. Remaining skeletal of human suspected burials get discovered the forensic anthropologist are initiated for gathering the information from the bones as well as the complete recovery context that needs to be determined about the person who is dead and what is the reason behind the death. Gender identification from fragmentary, dismembered, and mutilated human remains that get encountered in the situation of mass destruction, explosions, crashes of airplanes, homicides, criminal mutilation, assault cases, traffic accidents, and many more things, which can be very important in any kind of forensic investigation as it is the major challenge for the forensic professionals and the physical anthropologists.

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