SEX ESTIMATION FROM INDEX AND RING FINGER LENGTHS IN SOUTH INDIAN POPULATION

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Abstract
Sex estimation using unknown fragmented remains is one of the most important supplementaries in forensic identification. If sex cannot be determined by anatomical structures in forensic cases, it is a benefit to use anthropometric methods as a supplement to estimate sex of the individuals. Forensic odontology is the application of dental principles to legal issues. It is an investigative aspect of dentistry that analyzes dental evidence for human identification. Sex determination is a subdivision of forensic odontology, and it is important especially when information relating to the deceased is unavailable. Sex determination becomes the first priority in the process of identification of a person by a forensic investigator in the case of mishaps, chemical and nuclear bomb explosions, natural disasters, crime investigations, and ethnic studies. A self-structured questionnaire was distributed through a survey planet linked to 100 individuals of the general population of south India. The questionnaire was studied carefully and answers were marked by the participants. The results were collected and the data were analysed. The majority of the south Indian population are well known sex estimation from index and ring finger lenghts. The overall acceptance is a necessary measure. Most of them know Sex Estimation from index and ring finger lengths associated with the population around the world. 90% of the participants know theSex Estimation from index and ring finger lengths. The results of this survey concluded that in India people are well known about the Sex Estimation from index and ring finger lenghts.

Keywords: Index finger length, Index-ring finger ratio, Ring finger length, Sex estimation

Introduction

Identification of human remains is an important ingredient in medicolegal investigations. This process is a frequently encountered problem for researchers, mass disasters, explosions, airplane crashes, fire disasters, or murder cases where they are disintegrated to suppress the identity of the deceased [1] . One of the most important responsibilities of forensic anthropologists is the identification of dismembered, mutilated and fragmentary human remains and they realise this by determining the age, sex, stature and race of the cases [2]. Accurate sexing of human remains narrows the research to a certain extent and thus prepares the ground for final identification by directing the ongoing judicial investigation to other descriptive markers. Anthropometry, a multi-faceted technique for investigating sexual dimorphism, is a practical method with high predictivity and validity using regression analyses [3]. In order to assist the process in forensic investigations, various sex prediction studies were conducted using various body parts such as upper and lower extremities including hand and foot dimensions [4]. Besides the IFL and RFL, finger length ratios (IFL/ RFL) were also utilised for sex determination [5-7]. Finger ratios demonstrated to be sexually dimorphic population marker [8-10], and these ratios are related to prenatal oestrogen and testosterone levels. It is genetically controlled by the HOX genes which indirectly influence the prenatal production of testicular androgen and the development of the fingers . It has been proven that sexual dimorphism in finger ratios develops in the uterus at 13 and 14 weeks of gestation due to the effect of parental androgen and oestrogen . It is known for years that IFL/RFL ratio varies according to sex. Previous studies generally presented that males have a lower IFL/RFL ratio than females and this sex variation begins in fetal life, and individual IFL/RFL remains stable throughout the life . Previous studies on the IFL/RFL ratio in sex estimation has shown variable results and it is determined that the IFL/RFL ratios differ between populations . Also, its utility seems to be limited in medico-legal investigations . Considering the large number of racial and ethnic diversity due to genetic and environmental factors, more regional studies are needed . India as a country, consists of seven geographic regions and several ethnic groups are (average 23) in the minority in India . Individuals with Indian ethnicity constitute 78.1% of the population according to 2010 data [11]. In cases where only a part of the hand is available in forensic cases, it is clear that population-specific sex estimation models need to be developed

by using a hand or some part of the fingers. In this context; the current study was carried out to investigate sexual dimorphism in index and ring finger lengths as well as IFL/ RFL ratio and to develop reference models for sex estimation in indian population.

The aim of the current study is to evaluate the ability of estimating sex from index and ring finger lengths and their ratios in South Indian adults .

Materials and methods

A cross-sectional study was carried out on 200 adult volunteers (100 males and 100 females) aged between 18-25 years, and were selected from the Saveetha Dental College and hospitals, Saveetha Institute of Technical and Medical Sciences, Chennai, India by stratified randomisation method.Index finger length (IFL) and ring finger length (RFL) of the participants were measured following standard procedures and landmarks. Sex differentiation in the present study was based on sectioning point analysis. The 'sectioning point' for the IFL, RFL and the index and the ring finger ratio was estimated from the average of the mean of male and female values. Binary logistic regression (BLR) analysis was employed to derive a predicting equation for estimation of sex

Results and discussion

The results indicate that the Index Finger Length (IFL) and Ring Finger Length (RFL) were found to be significantly longer in males than females in both right and left hands (p<0.001). The RRFL and LRFL were found to be longer than RIFL and LIFL among both sexes. The mean values of IFL/RFL ratio were not statistically significant (p>0.05) for both sexes. Bilateral asymmetry was observed in RIFL and LIFL for both sexes (p<0.05). Statistically significant side differences were not observed in RRFL and LRFL for both sexes in the train group (p>0.05). Accuracy percentage for models ranged between 70.0% and 75.0% in the test group for both sexes. The most successfully classified sex variable was found to be RIFL (AUC=0.75). The results of the present study indicate that significant sex differences exist in the IFL and RFL and index and ring finger ratio. Among finger lengths, RFL is a better predictor of sex than IFL. It is further concluded that the index and ring finger length is of limited utility in estimation of sex in forensic casework and should be employed only in cases when no other means of sexing are available. The study suggests that the index and ring finger

ratio should not be employed in estimation of sex in forensic casework due to considerable overlap in male and female values.

Conclusion

When extremities or other body parts are not available for forensic investigation, estimation of sex from the IFL and RFL measurements is a complementary approach. The current research has suggested the implementation of IFL and RFL models to predict sex for south indian adults. It is recommended that index and ring finger lengths are useful and practical predictors of sex and could be utilised to predict sex of the individuals when more dependable approach for sex estimation are not existing during forensic investigations. Sex determination becomes one of the first priorities in the process of identification of a person by a forensic investigator in the case of mishaps, chemical and nuclear bomb explosions, natural disasters crime investigations, and ethnic studies. Forensic odontologists may help in determination of gender where skeletal remains create difficulty to forensic experts, especially when only fragments of the body are recovered. Thus, forensic odontologists may play a key role in identifying the gender.Estimation of sex from the IFL and RFL measurements is a supplementary approach when extremities or other body parts are not available for examination. The present study has highlighted the application of IFL and RFL to determine sex among individuals belonging to the south India. It is suggested that finger lengths are relatively useful predictors of sex and both IFL and RFL could be utilized to estimate sex of the individuals when more reliable means of sex estimation are not available during medico-legal investigations. This study further observes that the models derived for a population group have better applicability when applied on the same population. Studies on estimation of sex from finger lengths in different age groups and among different populations need to be encouraged.When extremities or other body parts are not available for forensic

investigation, estimation of sex from the IFL and RFL measurements is a complementary approach. The current research has suggested the implementation of IFL and RFL models to predict sex for adults. It is recommended that index and ring finger lengths are useful and practical predictors of sex and could be utilised to predict sex of the individuals when more dependable approach for sex estimation are not existing during forensic investigations.Determination of sex in case of medico-legal examination of a separated hand could be achieved accurately, simply, reliably and practically by obtaining anthropometric measurements of the hand (including hand dimensions, finger length and the IFL/RFL

ratio). Despite the necessity for gathering further data and updating the deduced indices in the future, these indices can be reliably used for determination of sex of india people born in the 20th century. A hand index of ⩽41.39 is indicative of female, and that of >41.39 is indicative of male. An IFL/RFL ratio of ⩾1.0321 and ⩾1.0432 for the right hand and left hand, respectively, are predictive of female; lower ratios are predictive of male. Sexual dimorphism can be assured using the IFL/RFL ratio in inhabitants of south indian people. The IFL/RFL ratio was preferable to the hand index for sexing the hands in the population studied. Further research using bigger sample sizes and in various societies are essential to confirm the possibility of using hand indices in the identification of sex for forensic investigations.Estimation of stature forms an important parameter to reach to the partial identification of an unidentified body and dismembered remains. The results of the present study indicate that the index and ring finger length can be efficiently used for estimation of stature. Most authors have underlined the need for population-specific stature estimation formulae. Present study we derived a separate regression equation to estimate stature from right index and ring finger length for south Indian population. Present study revealed that the RFL can be used with high significant values for estimation of stature in the South Indian population even if only an amputated hand is found and other body parts are unavailable. The results of present study are however, applicable only when an intact finger is examined. Such studies can help in narrowing down the pool of possible victim matches in cases of identification from dismembered remains.

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