



GENDER DISCRIMINATION & STATURE ESTIMATION FROM THUMB LENGTH OF THE POPULATION OF WESTERN UTTAR PRADESH

Kangana Aggarwal., Amit Chauhan*., Rhythm Gandhi and Shukla S K

Amity Institute of Forensic Sciences, Amity University, Sec-125 (Noida) Uttar Pradesh, INDIA-201313

ARTICLE INFO

Article History:

Received 11th December, 2017

Received in revised form 12th

January, 2018 Accepted 05th February, 2018

Published online 28th March, 2018

Key words:

Personal identification, stature, gender, length, investigation, estimation etc.

ABSTRACT

In today's scenario, identification of an individual has become one of the most important aspects of investigation as well as identity in our society. The advance technologies have taken place, even still, some of the aspects are left questionable for establishing identity of suspects from the minutiae details which can reveal or provide the clue about the culprit/suspect involved in omission of act. In forensic investigation, minutiae details left over the scene of occurrence are sufficient to disclose the identity of victim/suspect. These details need a careful analysis/ intensification which are left over any surface or objects unknowingly while in some cases where the unidentified dead bodies are recovered from the crime scene, the Skelton remains could provide the details such as the stature, gender and age of the victim. Distinguish scientists came out with innovative technology and methods to study these remains and give their contribution by establishing new parameters of identification. In this present study, we studied the thumb length to determine the stature and to discriminate the gender from the population of western Uttar Pradesh and successfully concluded that the suspect can be nabbed from the intensified thumb length or Skelton remaining that are encountered during the investigation of several types of cases.

Copyright©2018 **Kangana Aggarwal et al.** This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

The modern era of advancement and digital technology has facilitated the identification of an individual for various aspects such as, national identity, gender, age, profession or any criminal record or involvement in any conspiracy etc^{1,2}. Investigators often experience some problematic situations in the identification of people which may be cause of natural disasters such as floods, hurricanes, earth-quake tsunami, or in cases of explosion, plane crash etc. Excessive complications are faced in the burnt dead bodies where only remnants are recovered^{3,4,5}.

In Anthropology, investigators deal with the bones remnants to extract out the information about an individual from them⁶. Personal identification of an individual is based on the uniqueness records or multiple consistent features i.e. tattoo marks, birth mark, injury marks etc. and very important in any investigation to turn it out is the responsibility of forensic expert/ medico-legal officer⁷. In anthropology, personal identification deals with the estimation of gender, age, stature etc. by thoroughly studying the Skelton or remnants or bones⁸. Strategies to decide stature make presumptions about extents of the human body.

This is especially the case for relapse strategies, which force a straightforward relationship between the measure of a particular bone and stature⁹. There is diverse arrangement of formulae for different gatherings and populace. Gender estimation is based at the morphological features of pelvis and skull because of conceptive necessities indicates distinctive characteristics elements^{10,11}. These morphological features of skeletal elements help to discriminate, that is, the incidence of non-metric traits on each of the bone. For example, these features include the degree of fusion of the proximal and distal epiphyses, fusion of the cranial sutures, dental eruption patterns etc^{12,13}.

A numerous methods are used by forensic anthropologists to estimate the age at death from remnants by using of a correlation, regression equations which provide assistance in estimating other physical attributes like structure to get aid in the identification of victim^{14,15}. In the previous studies conducted by scientists & researchers, it was observed that a proportions of body segment vary between the population of one place from other place which may be a cause of metamorphosis in environment, occupation etc¹⁶. Because of different body parts response differently and ripen change in environmental conditions as well as genetics¹⁷.

Assorted studies have been carried out by many researchers to establish a relation between the height/ stature with gender. This study was conducted by using the thumb length of both of hands as a parameter of the population of Western Uttar

*Corresponding author: **Amit Chauhan**

Amity Institute of Forensic Sciences, Amity University, Sec-125 (Noida) Uttar Pradesh, INDIA-201313

Pradesh. The researchers were incapable to ascertain the stature and gender of the defunct accurately by the use of some statistical equations for completion of this study¹⁸. The results of this study can be used by forensic anthropologists like other investigative techniques which will standardized and worldwide acceptable for investigation¹⁹.

METHODOLOGY

As discussed earlier, this present study was carried out to study the stature of an individual and gender discrimination from the thumb length of the population of Western Uttar Pradesh (INDIA). All the samples were collected from the villages Ramala, Kirthal and Barout of district Baghpat. The aim of this study was to establish the degree of reliability for the identification purpose.

MATERIAL AND METHOD

For this pilot study, 60 individuals including 30 males and 30 females from the age group of 22-30 years were selected. Sample selection was done randomly and the consent of the subjects were taken prior by explaining the purpose of this study. All the subjects included in the present study were healthy and had no history of any sort of deformity of the hand, metabolic disorders and any developmental process. To avoid any kind of diurnal variation, all the measurements were taken during day time interval. All the measurement was taken with the help of anthropometric board. Measurements of stature were taken as vertical distance from the vertex to the foot.

To measure the stature, all the subjects were asked to stand barefoot on the platform of stadiometer with the upper back, and heels pressed against the wall thus ensuring their upright position, while head was positioned in the Frankfurt horizontal plane.

During the measurement of thumb length, all the subjects were asked to turn inverse their palm & fingers horizontally towards the stand following by the Frankfurt plane²⁰. The movable rod of stadiometer was brought in contact with vertex in the mid-sagittal plane. All the measurements of thumb were measured with the help of a sliding calliper, when the subjects placed their hands supine on a flat horizontal surface with the fingers extended²¹. The measurement of thumb length was obtained up to one decimal place and avoid any kind of error, all the measurements were taken twice and the average of both of measures were considered for the further analysis.

To avoid any kind of instrumental error or variation, all the instruments were verified at significance level and a variation of ±0.01cm was observed.

Statistical Analysis

The data was tabulated, analyzed and subjected to statistical analysis using SPSS software (latest version, 11.0).

RESULT AND DISCUSSION

To calculate out the height of an individual, bones especially long bones are preferable in practice because of their higher correlation coefficient and small error of to estimate the stature. However, the difficulties arise in that condition where only dissect body parts are available for medical examination and further analysis. Hence, forensic investigators are exploring new parameters and establishing new methods to estimate the stature, gender discrimination by the measurements of head, foot, face, finger lengths, phalanges etc.

As described earlier, to conduct this study a data of sixty subjects (including male & female) were collected by taking their respective measurements. These measurements are given below in table no.-1-

Table no. 1 data of both genders according to age and the measurements of right-hand and left-hand thumb

Serial no.	Age	Right hand thumb measurement	Left hand thumb measurement	Age	Right hand thumb measurement	Left hand thumb measurement
Female subject's data				Male subject's data		
1.	25	7.30	7.10	25	6	6.2
2.	25	6.50	6.30	25	6.6	6.6
3.	24	6.80	7.00	24	6.4	6.5
4.	28	7.10	7.10	23	6.5	6.5
5.	25	7.00	7.00	24	6.5	6.3
6.	25	6.50	6.60	24	6.4	6.2
7.	23	6.90	7.00	23	6	6.2
8.	24	6.50	6.60	24	6.5	6.8
9.	24	6.80	7.00	28	6.6	6.6
10.	23	7.00	7.20	24	6.1	6
11.	23	6.50	6.60	23	6.5	6.8
12.	22	6.90	7.00	24	6.6	6.6
13.	23	6.50	6.60	24	7.1	7
14.	23	7.50	7.50	24	6.2	6.4
15.	23	7.30	7.40	23	6.3	6.4
16.	25	7.30	7.50	23	6.1	6.1
17.	25	7.00	7.00	28	6.7	6.6
18.	25	7.70	8.00	24	6.6	6.5
19.	28	6.70	7.40	26	6	6.5
20.	25	6.40	6.20	24	6.3	6.6
21.	25	7.00	7.50	25	6.6	6.9
22.	27	7.40	7.30	24	6.3	6.7
23.	26	7.00	7.20	26	6.8	7
24.	26	7.30	7.30	24	6.8	6.7
25.	25	7.00	6.90	25	6	6
26.	24	7.20	7.20	23	6.4	6.6
27.	24	7.20	7.10	23	6.5	6.6
28.	23	7.70	8.00	23	6.5	6.6
29.	24	7.40	7.50	23	6.9	6.8
30.	23	7.40	7.70	23	6.3	6.5

The dossier of measured subjects right hand and left- hand thumb is described in the given table according to their respective age.

Table no.2 Pearson correlation coefficient of thumb measurements with stature and p value in females

Right thumb			Left thumb		
Thumb	Correlation coefficient	p value	Thumb	Correlation coefficient	p value
	0.383	<0.001		0.359	<0.001

Note: Since p is greater than 0.005 it is significant.

Table no.3 Pearson correlation coefficient of thumb measurements with stature and p value in males

Right thumb			Left thumb		
Thumb	Correlation coefficient	p value	Thumb	Correlation coefficient	p value
	0.383	<0.001		0.359	<0.001

Table no.4 Regression equation for estimation of stature in females

Right hand		Left hand	
Thumb	Height = 116.71+ 6.42	Thumb	Height = 112.61+ 7.00

Table no.5 Regression equation for estimation of stature in males

Right hand		Left hand	
Thumb	Height = 104.226 + 9.432	Thumb	Height = 129.753 + 5.707

Table no.6 Regression coefficient estimation for females

Fingers (thumb)	Constant in cm (b ₀)	Regression coefficient in cm (b ₁)
Right thumb	116.71	6.42
Left thumb	112.61	7.00

Table no.7 Regression coefficient estimation for males

Fingers (thumb)	Constant in cm (b ₀)	Regression coefficient in cm (b ₁)
Right thumb	104.22	9.43
Left thumb	129.75	5.70

For correlation coefficient for right thumb in females we used the regression coefficient $y=(b_0 +b_1) x$.

For right thumb measurements in male

$y=B_0+B_1x$

$B_0=104.22$

$B_1=9.43$

$x=7$

$y=104.22+9.43x=162.2$

Measured height=163.1cm

To estimate the stature, linear regression equation derived from the thumb length shows a significant statistically ($p<0.001$) relationship between them.

From the regression models derived in the present study the standard error of estimate in the predicted stature was more in males than the females. In other words, the accuracy of stature estimation in females is more than males. According to our study height and length of the hand were significantly more in males compared to females. There was no bilateral variation of right and left fingers.

CONCLUSION

Since very early of time, stature estimation and gender discrimination from the skelton remains have been used for the identification of an individual but a very few work exists about the gender discrimination and stature estimation from the thumb length. As a resultant of this study, it was observed that thumb length is a good and reliable method for gender discrimination and stature which raised hopes that even a Skelton of thumb can conclude the identity of suspect/victim. Every year around 2,22,446 dead bodies are recovered and among them only 5% are found in appropriate condition while rest are found in decomposed, putrefied or Skelton form. In such cases, when the identity of actual person wouldn't possible then stature is estimate along with gender identification and age determination. This study will help the investigators to collect information about victim around the particular area while minimize the time duration of investigation. It could be proved as a milestone for justice system in the population of western Uttar Pradesh.

References

1. Tyagi AK, Kohli A, Verma SK, Aggarwal BB; Correlation between stature and finger Length. *International Journal of Medical Toxicology and Legal Medicine*, 1999; 1: 20- 22
2. Rastogi P, Kanchan T, Menezes RG, Yoganarasimha; Middle finger length- a predictor of stature in the Indian population. *Med Sci Law*, 2009; 49 (2): 123-126.
3. Athwale MC; Estimation of height from length of forearm bones. A study on 100 Maharashtrian male adults of age 25-30. *American Journal of Physical Anthropology*, 1963; 21: 105-112.
4. Begum E; Estimation of Stature from Hand Measurements in Assamese Muslims. Bulletin of Department of Anthropology, University ofGuwahati, Assam, 1999.
5. Bhatnagar DP, Thapar SP, Batish MK; Identification of personal height from somatometry of hands in the Punjabi males. 1987
6. Rani M, Tyagi AK, Ranga VK, Rani Y, Murari A; stature estimates from foot dimensions. *JPAFMAT*; 2011:11(1)
7. Jasuja OP, Singh G; Estimation of stature from hand and phalange length. *JIAFM*, 2004; 26(3).
8. Giles E, Vallandigham PH; Height Estimation from Foot and Shoe print length. *Journal of Forensic Sciences*, 1991; 36(4): 1134-1151.
9. Jasuja OP, Singh J, Jain M. Estimation ofstature from foot and shoe measurements bymultiplication factors: A reviewed attempt. *Forensic Science International*, 1991; 50: 203-215.
10. Jasuja OP, Manjula; Estimation of staturefrom footstep length. *Forensic Science International* 1993; 61:1-5.
11. Jasuja OP, Harbhajan S, Anupama K; Estimation of stature from stride length while walking fast. *Forensic Science International*, 1997; 86: 181-186.
12. Kapoor AK; Estimation of stature from hand length as obtained through palm prints among the Lodhas of district Midnapur, West Bengal. *Indian Journal of Physical Anthropology*, 1987; 13: 139.

13. Lal CS, Lala JK; Estimation of stature from tibial and ulnar lengths in North Bihar. *Journal of Medical Association*, 1972; 58: 120-121.
14. Patel MP, Joshi NB, Dongre AV; Regression equation of height on tibial length. *Indian Journal of Medical Research*, 1964; 52: 531- 534.
15. Pearson K.; Mathematical contributions to the theory of evolution V: On the reconstruction of stature of pre-historic races. Philosophical Transaction of Royal Society; London; 1899; 192: 169-224.
16. Saxena SK; Study of correlations and estimation of stature from hand length, hand breadth and sole length. *AnthropolAnz.*, 1984; 42(4): 271-276.
17. Sharma PK, Kapoor AK; Estimation of stature from fingertip length and finger print tiplength among criminals, Recent advances in forensic biology (edited), Kamla-RajPublishers, 2001: 117-127.
18. Shintaku K, Furuya Y. Estimation of stature based on the proximal phalangeal length of Japanese women's hands. *JUEOH*, 1990; 12(2): 215-219.
19. Thakur SD, Rai KS; Determination of Stature from hand measurement, *Medicine Science and Law*, 1987; 78: 25-28.
20. Trotter M, Glesser GC; Estimation of stature from long bones of American White and Negroes, *American Journal of Physical Anthropology*, 1952; 10: 463.
21. Baul S; Anatomical Clinical Study of Human foot. M.S. Thesis, Punjabi University, Patiala 1974.

How to cite this article:

Kangana Aggarwal *et al* (2018) 'Gender Discrimination & Stature Estimation From Thumb Length of the Population of Western Uttar Pradesh', *International Journal of Current Advanced Research*, 07(3), pp. 10828-10831.
DOI: <http://dx.doi.org/10.24327/ijcar.2018.10831.1854>
