ORIGINAL ARTICLE

Stature estimation using head circumference

R. Prenetha, K. Yuvaraj Babu

Department of Anatomy, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, Tamil Nadu, India

J. Adv. Pharm. Technol. Res.

ABSTRACT

Stature is an essential measurement in anthropometry that resolves individual representation of the body. Forensic determination is the resolution of origin, sex, and natural height. Many previous study has been done on estimation of height using various measurements of teeth and skull. The aim of this study was to estimate stature from head circumference and to derive a linear regression formula between them. The study was conducted in Saveetha Dental College among 70 1st year students (35 males and 35 females). Stature was measured using a stadiometer and head circumference was measured using measuring tape. All the measurements were tabulated and linear regression equation was done using the SPSS software (version 23). For males, $Y = 1.85x + 71.12$, $r = 0.487$; for females, $Y = 2.07x + 46.24$, $r = 0.433$. By the study, we know that in both genders, head circumference has moderate correlation in estimating stature. From the present research, we conclude that head circumference is a moderately reliable parameter for stature estimation in both genders.

Key words: Head circumference, human stature, innovative stature estimation, linear regression equation

INTRODUCTION

Stature is an essential measurement in anthropometry that resolves individual representation of the body.[1] Forensic determination is the resolution of origin, sex, and natural height.[1,2] Forensic science was explained as the implementation of scientific techniques and procedures for valid purpose.[3] Human variation is an essential constituent of human population[4] Anthropometry is a sequence of customized measuring procedures that conveys the measurable proportions of skeleton and body.[5,6] For stature estimation using skeletal remains, long bones of the body have been used most commonly.[7]

Stature estimation of decayed, incomplete, and crippled human bodies are of major forensic significance. Forensic specialists frequently require the height determination of the deceased from such a body.[8] Anthropometry work of the skeleton from various biological structure for evaluation of stature is needed not only to forensic specialist but also to anatomist.[9] Stature in relation to skull and jaw dimension is most often described in different population.[7] Calculation of stature of individual assists in the examination of a person in huge catastrophe.[10]

Many previous studies have been done on the estimation of height using various measurements of teeth and skull:[7] Footprint measurements in Bangladeshi adults,[11] forearm length in North Karnataka population,[6] maxilla and facial measurements in a Indian population,[12] intermastoid distance,[1] long bones of American white and negros,[13] and from hand and foot measurements in a rare tribe of

Address for correspondence:
Dr. K. Yuvaraj Babu,
Department of Anatomy, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Velappanchavadi, Chennai - 600 077, Tamil Nadu, India.
E-mail: yuvarajkbabu@gmail.com

Submitted: 24-Apr-2022 **Revised:** 11-Jul-2022
Accepted: 12-Jul-2022 **Published:** 30-Nov-2022

Access this article online	
Quick Response Code:	Website: www.japtr.org
	DOI: 10.4103/japtr.japtr_217_22

How to cite this article: Prenetha R, Babu KY. Stature estimation using head circumference. J Adv Pharm Technol Res 2022;13:S140-3.

Kerala state in India.[13,14] The extensive knowledge and experience of our research team have been translated into high quality publications.[15-34] The present study was taken with an aim to investigate the stature estimation using head circumference and to derive the linear regression formula and to prove head circumference is a reliable source for stature estimation.

MATERIALS AND METHODS

The study was conducted in Saveetha Dental College among 70 1st year students (35 males and 35 females) with age of 18–20 were selected. This study was approved by SRB of Saveetha Dental College (IHEC/SDC/ANAT/21/215).

Stature

The stature (or) height of an individual was measured in erect standing posture from heal to the vertex using a standing height measurement frame.

Head circumference

The head circumference of the subjects was measured from glabella to glabella using nonstretchable plastic measuring tape which has passed through opisthocranion (just above eye ridges) [Figure 1]. The measurements were tabulated and a linear regression equation was estimated using IBM SPSS Statistics (Version 23).

RESULTS

Using the data from Table 1, the linear regression equation was estimated using the formula:

Y = a + bx, Where, x = Head circumference in cm, Y = Height in cm, a and b are constants.

- For males, Y = 71.12 + 1.85x ± 3.14; r = 0.48 which is having moderate correlation
- For females, Y = 46.24 + 2.07x ± 3.98; r = 0.43 which is having moderate correlation.

Figure 1: Measurement of head circumference

DISCUSSION

Stature estimation can be done in various ways. In our study, we observed that correlation coefficient was found to be 0.48 for males and 0.43 for females. Similar findings in the previous literature, where the linear regression equation were expressed as Y = 2.81x + 137.39, r = 0.57 in males had moderate correlation and Y = 0.49x = 155.39, r = 0.39 in females having weak/no correlation was observed.[1]

Another study describes that correlation coefficient of total facial height (TFH) in male was found to be 0.038 which is having weak/no correlation in males. Whereas correlation coefficient of nasal height (NH) in male was found to be 0.034 which was also having weak/no correlation in males. Whereas the linear regression equation was expressed as stature (cm) =156.34+1.28xTFH for total facial height and the linear regression equation is expressed as stature (cm) =156.86+3.01xNH for NH in males. Correlation coefficient of total facial length (TFH) in female was 0.026 had weak/no correlation, whereas correlation coefficient of NH in female was found to be 0.038 which is also having weak/no correlation. Whereas the linear regression equation is expressed as stature (cm) =144.96+1.12xTFH for total facial height (TFH) in females. Whereas linear regression equation is expressed as stature (cm) =142.71+3.11xNH for NH in females.[12]

In another study, the linear regression equation of the right forearm length (RFL) in males was found to be stature (cm) =2.887xRFL+95.82 with a r = 0.500 and the linear regression equation of the left forearm length (LFL) in male was found to be stature (cm) = 2.128xLFL+116.5 and r value was 0.615 both had moderate correlation. Whereas in females, the linear regression equation of RFL was found to be stature (cm) =2.427xRFL+99.46 and for LFL in females was found to be stature (cm) =2.632xLFL+95.08, respectively, in North Karnataka population.[6] In the present study, the sample size was limited for stature estimation using head circumference. In future, we are planning to increase the sample size and measure among different age groups.

Table 1: Values of various measurement obtained in study

	Male	Female
n	35	35
Mean of head circumference (X in cm)	55.23±2.33	54.26±2.45
Mean of height (Y in cm)	173.54±3.81	158.62±4.12
Correlation coefficient (*r*)	0.48	0.43
A	71.12	46.24
B	1.85	2.07

CONCLUSION

From the present research, we conclude that head circumference is a moderately reliable parameter for stature estimation in both genders.

Acknowledgment

We acknowledge and thank all the participants for their cooperation in the study.

Financial support and sponsorship

The present project is supported/funded/sponsored by:

- Saveetha Institute of Medical and Technical Sciences
- Saveetha Dental College and Hospitals
- Saveetha University and
- Ashwin Dental Care, Chennai.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Akhter Z, Banu LA, Alam MM, Rahman MF. Stature estimation from craniofacial anthropometry in Bangladeshi Garo adult females. Mymensingh Med J 2012;21:479-84.
2. Krishna RN, Nivesh Krishna R, Yuvaraj Babu K. Estimation of stature from physiognomic facial length and morphological facial length. Res J Pharm Technol 2016;9:2071.
3. Singh B, Krishan K, Kaur K, Kanchan T. Estimation of body weight from the base of gait and the area swept in one stride-Forensic implications. Egypt J Forensic Sci 2018;8:48,1-7.
4. Devi RS, Mohanraj KG. Estimation of stature from cephalometric parameters in young female population. Int J Pharm Res 2017;9 (3). [doi: 10.31838/ijpr/2020.12.03.350].
5. Oluwole AO. Comparative effects of exercise on selected cardiorespiratory parameters among young adults from different ethnic groups resident in Nigeria. Am J Clin Exp Med 2014;2:123.
6. Londhe S, Panjakash S, Mirzanaik AD. Stature estimation from forearm lengths in North Karnataka population; India. Indian J Clin Anat Physiol 2019;6:32-7.
7. Kalia S, Shetty SK, Patil K, Mahima VG. Stature estimation using odontometry and skull anthropometry. Indian J Dent Res 2008;19:150-4.
8. Shah RK, Kanani SK, Patel JP, Nirvan AB, Patel BG. Estimation of stature from head circumference in Gujarati adolescent population. Natl J Clin Anat 2017;06:146-51.
9. Prasad IM, Mohan Prasad I. Estimation of stature from head length and head breadth by regression analysis in south India population. Indian J Forensic Med Pathol 2020;13:427-32.
10. Gul H, Nizami SM, Khan MA. Estimation of body stature using the percutaneous length of ulna of an individual. Cureus 2020; 12(1), e6599. [doi: 10.7759/cureus. 6599].
11. Asadujjaman M, Rashid MH, Rana MS, Hossain MM. Stature estimation from footprint measurements in Bangladeshi adults. Forensic Sci Res 2022;7:124-31.
12. Wankhede KP, Kamdi NY, Parchand MP, Anjankar VP, Bardale RV. Estimation of stature from maxillo-facial anthropometry in a central Indian population. J Forensic Dent Sci 2012;4:34-7.
13. Black TK. The Biological and Social Analyses of a Mississippian Cemetery from Southeast Missouri: The Turner Site, 23BU21A. 68. Museum of Anthropology, University of Michigan,;1979.
14. Asadujjaman M, Hossain MG, Rana MS, Islam MZ. Stature estimation from handprint measurements: An application to the medicolegal investigation. Egypt J Forensic Sci 2021;11:1.
15. Sekar D, Lakshmanan G, Mani P, Biruntha M. Methylation-dependent circulating microRNA 510 in preeclampsia patients. Hypertens Res 2019;42:1647-8.
16. Princeton B, Santhakumar P, Prathap L. Awareness on preventive measures taken by health care professionals attending COVID-19 patients among dental students. Eur J Dent 2020;14:S105-9.
17. Logeshwari R, Rama Parvathy L. Generating logistic chaotic sequence using geometric pattern to decompose and recombine the pixel values. Multimed Tools Appl 2020;79:22375-88.
18. Johnson J, Lakshmanan G, Biruntha M, Vidhyavathi RM, Kalimuthu K, Sekar D. Computational identification of MiRNA-7110 from pulmonary arterial hypertension (PAH) ESTs: A new microRNA that links diabetes and PAH. Hypertens Res 2020;43:360-2.
19. Paramasivam A, Priyadharsini JV, Raghunandhakumar S, Elumalai P. A novel COVID-19 and its effects on cardiovascular disease. Hypertens Res 2020;43:729-30.
20. Pujari GR, Subramanian V, Rao SR. Effects of *Celastrus paniculatus* Willd. and *Sida cordifolia* Linn. in kainic acid induced hippocampus damage in rats. Ind J Pharm Educ 2019;53:537-44.
21. Rajkumar KV, Lakshmanan G, Sekar D. Identification of miR-802-5p and its involvement in type 2 diabetes mellitus. World J Diabetes 2020;11:567-71.
22. Ravisankar R, Jayaprakash P, Eswaran P, Mohanraj K, Vinitha G, Pichumani M. Synthesis, growth, optical and third-order nonlinear optical properties of glycine sodium nitrate single crystal for photonic device applications. J Mater Sci Mater Electron 2020;31:17320-31.
23. Wu S, Rajeshkumar S, Madasamy M, Mahendran V. Green synthesis of copper nanoparticles using *Cissus vitiginea* and its antioxidant and antibacterial activity against urinary tract infection pathogens. Artif Cells Nanomed Biotechnol 2020;48:1153-8.
24. Vikneshan M, Saravanakumar R, Mangaiyarkarasi R, Rajeshkumar S, Samuel SR, Suganya M, *et al.* Algal biomass as a source for novel oral nano-antimicrobial agent. Saudi J Biol Sci 2020;27:3753-8.
25. Alharbi KS, Fuloria NK, Fuloria S, Rahman SB, Al-Malki WH, Javed Shaikh MA, *et al.* Nuclear factor-kappa B and its role in inflammatory lung disease. Chem Biol Interact 2021;345:109568.
26. Rao SK, Kalai Priya A, Manjunath Kamath S, Karthick P, Renganathan B, Anuraj S, *et al*. Unequivocal evidence of enhanced room temperature sensing properties of clad modified Nd doped mullite Bi2Fe4O9 in fiber optic gas sensor. J Alloys Compounds 2020;838:155603.
27. Bhavikatti SK, Karobari MI, Zainuddin SL, Marya A, Nadaf SJ, Sawant VJ, *et al*. Investigating the antioxidant and cytocompatibility of *Mimusops elengi* Linn extract over human gingival fibroblast cells. Int J Environ Res Public Health 2021;18:7162.
28. Marya A, Karobari MI, Selvaraj S, Adil AH, Assiry AA, Rabaan AA, *et al*. Risk perception of SARS-CoV-2 infection and implementation of various protective measures by dentists across various countries. Int J Environ Res Public Health 2021;18:5848.
29. Barma MD, Muthupandiyan I, Samuel SR, Amaechi BT. Inhibition of Streptococcus mutans, antioxidant property and cytotoxicity of novel nano-zinc oxide varnish. Arch Oral Biol 2021;126:105132.
30. Vijayashree Priyadharsini J. *In silico* validation of the non-antibiotic drugs acetaminophen and ibuprofen as antibacterial agents against red complex pathogens. J Periodontol 2019;90:1441-8.
31. Priyadharsini JV, Vijayashree Priyadharsini J, Smiline Girija AS, Paramasivam A. *In silico* analysis of virulence genes in an emerging dental pathogen *A. baumannii* and related species. Arch Oral Biol 2018;94:93-8.

32. Uma Maheswari TN, Nivedhitha MS, Ramani P. Expression profile of salivary micro RNA-21 and 31 in oral potentially malignant disorders. Braz Oral Res 2020;34:e002.
33. Gudipaneni RK, Alam MK, Patil SR, Karobari MI. Measurement of the maximum occlusal bite force and its relation to the caries spectrum of first permanent molars in early permanent dentition. J Clin Pediatr Dent 2020;44:423-8.
34. Chaturvedula BB, Muthukrishnan A, Bhuvaraghan A, Sandler J, Thiruvenkatachari B. Dens invaginatus: A review and orthodontic implications. Br Dent J 2021;230:345-50.