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Correlation Of Body Height And Head Length In Young Individuals

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Abstract:

Introduction:

Body height is an important measure of physical identity. Height exhibits a dimensional relationship with various parts of the body. This relationship helps to calculate height from dismembered and mutilated body parts in forensic examinations. The aim of this study is to find the correlation between body height and face length

Materials and methods:

This descriptive cross-sectional study was conducted among 100 dental students.The head length was measured with the help of spreading caliper. Data obtained were analyzed to find the correlation between head length and height. Data analysis was done using SPSS software version 23 . Independent-T test was done to find the association between variables.

Results:

A significant positive correlation was observed between head length and height.The p value less than 0.05 was considered statistically significant.

Conclusion:

It was observed in the present study that there is a positively significant correlation between height and head length in all the age groups. Head length is a reliable indicator in estimation of height.

Keywords: head length; height; anthropometric estimation; innovative method.

INTRODUCTION:

Body height is one among the useful anthropometric parameters for individual identification. Establishing the identity of a person from mutilated body fragments is a crucial aspect in natural disasters. Body height features a definite and proportional biological relationship with each part of the physical body like head, face, trunk and extremities(1). There's no universally applicable formula derived for the estimation of body height from different body parts.The connection between height and different body parts differ consistent with race, ethnicity, age and sex (2).

It is documented that the accurate investigation of stature helps to determine an individual's identity in medico legal investigations involving skeletal remains. Being one among the standard of personal identification, stature helps in narrowing down the investigation process, and thus provides useful clues for the investigating institution(3). The anatomical and mathematical methods are the 2 main techniques for the estimation of living stature(4). The anatomical method involves the direct reconstruction of stature by measuring and adding together the lengths or heights of all the skeletal elements from the skull to the foot and figuring a correction factor for soft tissues(5). The tactic is believed to supply the simplest approximation when it's applicable. However, it's not always possible to get the entire skeleton. The mathematical method is predicated upon the proportion of certain bones to living stature or cadaver length because proportions don't alter with age after skeletal maturity has been fully completed(6).

Long bones, especially those of lower limbs are considered the best indicator of living stature. However, intact main long bones of limbs are not always available. Several regression equations using the measurements from other postcranial bones or bone segments have been calculated to estimate body height in the absence of intact long bones(7). Other than long bones, hand and foot dimensions are the most commonly used anthropometric measurements for stat- ure estimation(8). Even measurements from isolated bones of the hand or foot such as the metacarpal or tarsal bones have been evaluated as independent variables for the estimation of body height . Not only the absolute anthropometric dimensions but also measurements such as arm span or sole length have also been used for estimating body height(9). The aim of this study is to find the correlation between body height and face length, and to find whether body height can be estimated using face length.

MATERIALS AND METHODS:

Body height and face length were collected from young adults. Approval was obtained from the scientific review board and institutional ethical committee of Saveetha University. Written informed consent was obtained from all the participants prior to the start of the study. Sample size was arrived at as 40 in reference with the key article.This study comprises two measurements namely body height and head length.Body height was measured using a stadiometer and head length was calculated using a spreading calliper.Data analysis was done using SPSS software version 23 (statistical package for social sciences). Independent-T test was done to find the association between variables. Statistical significance was set at $p<0.05$. In this study young adults were included and people with language barriers, and people with injuries in the head were excluded.

RESULT:

Coefficients

Model	Unsaturated coefficient		Standardized coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	13.862	1.801		7.698	.000
Facial height	.301	.121	.551	2.482	.017
Body Height	-.004	.018	-.054	-.242	.810

A. Dependent variable: age

Table 1:- Table showing the T values of facial height and body height of the study participants which was found to be 2.482 and -0.242 respectively. p value was 0.00($p<0.05$) which was found to be statistically significant.

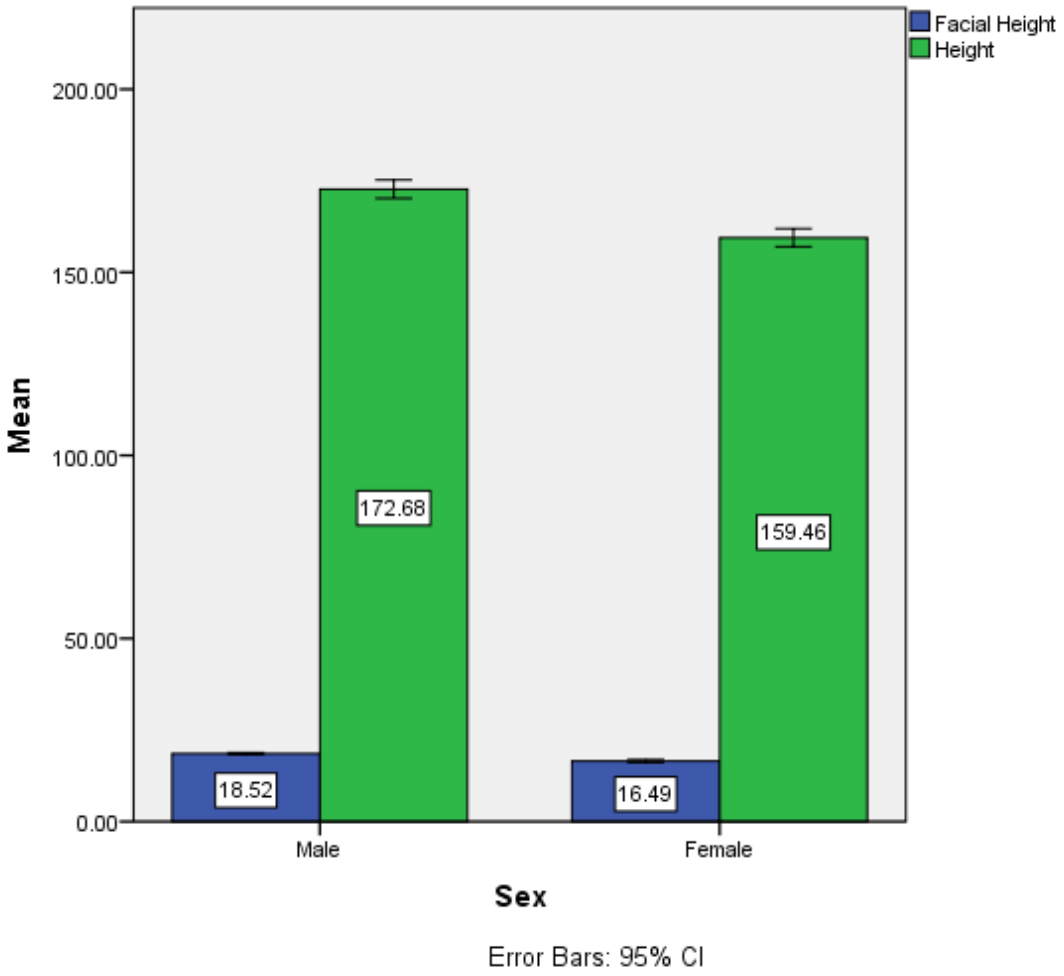

Figure 1: Bar graph representing the correlation between gender and comparison between body and facial height. X-axis represents gender and Y-axis represents mean value.The mean value for facial height (blue) for males and females is 18.52 and 16.49 respectively. The mean value for body height in males and females (green) is 172.68 and 159.46 respectively. The p value for the above graph is 0.00 ($p<0.05$) so it's statistically significant implying that males have greater facial height and body height than females.

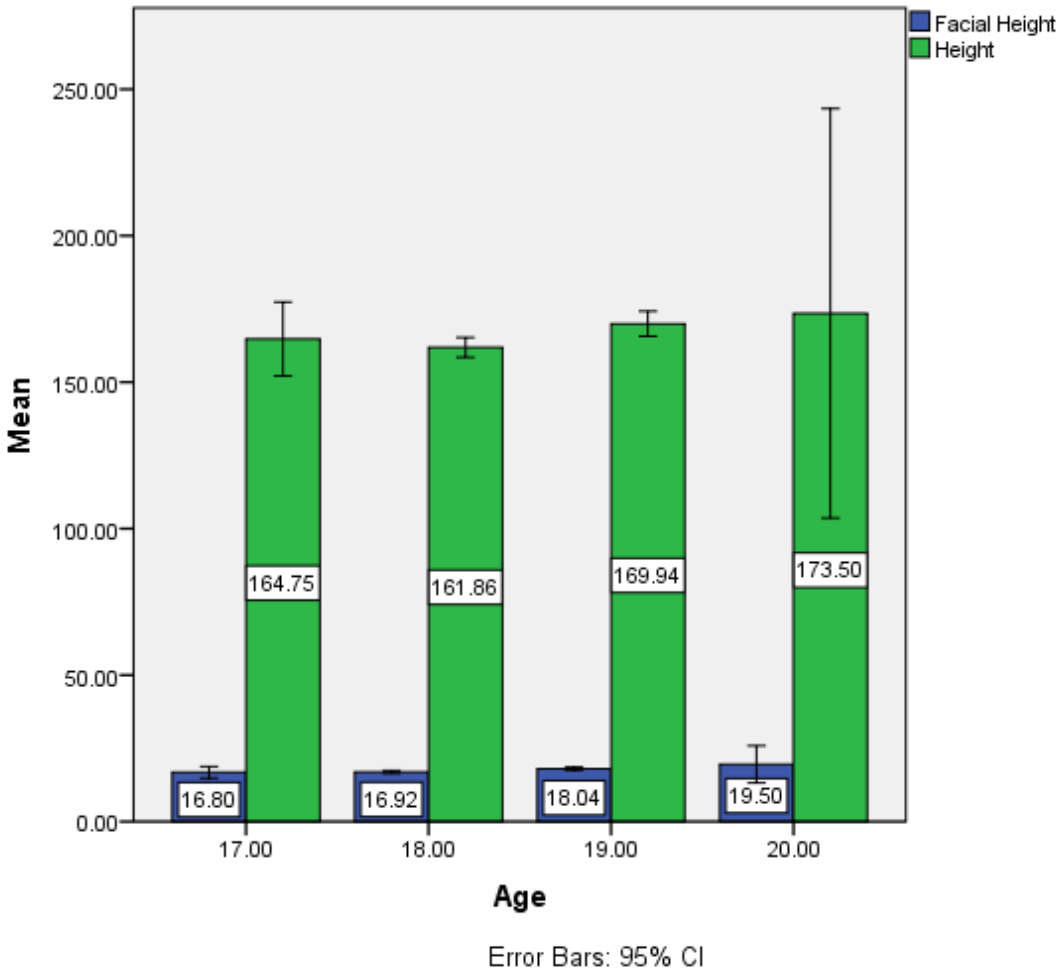

Figure 2: Bar graph representing the correlation between age and comparison between body and facial height. X-axis represents age and Y-axis represents body and facial height. The mean value for facial height (blue) for the age 17 is 16.80 and body height (green) is 164.75. The mean value for facial height (blue) for the age 18 is 16.92 and body height(green) is161.86. The mean value for facial height (blue) for the age 19 is 18.04 and body height (green) is 169.94. The mean value for facial height (blue) for the age 20 is 19.50 and body height (green) is 173.50. The p value for the above graph is 0.00 ($p<0.05$) which is statistically significant implying that with increase in age facial height and body height relatively increases.

In our study, body height and facial height was measured in 40 participants. A correlation was done between gender and comparison between body height and facial height. Mean value for facial height was calculated and was found to be 18.52 (blue) and 16.49 (blue) in males and females respectively. Mean value for body height was calculated and was found to be 172.68 (green) and 159.46 (green) in males and females respectively. p value was found to be 0.00 ($p<0.05$), so it's statistically significant implying that males have greater facial height and body height than females (Figure 1). Another correlation was done between age and comparison between body height and facial height. The mean value for facial height (blue) for the age 17, 18, 19 and 20 years was 16.80, 16.92, 18.04 and 19.50 respectively. The mean value for body height (green) for the age 17, 18, 19 and 20 years was 164.75, 161.86, 169.94 and 173.50 respectively. P value was found to be 0.00($p<0.05$) so it's statistically significant implying that with increase in age, facial height and body height relatively increases (Figure 2). T values of facial height and body height of the study participants were calculated and found to be 2.482 and -0.242 respectively. p value was 0.00($p<0.05$) which was found to be statistically significant. (Table 1)

DISCUSSION:

Measurements from the members of the skeletal structure for stature determination aren't so common(10). It's been reported that sacral dimensions and measurements from sacral segments are often used with moderate accuracy to predict stature(11). Only a couple of studies have reported on reconstructing stature from head and face dimensions. However, there are cases brought for forensic examination where only the craniofacial region is out there(12). Additionally, within the field of archeology, more skulls are commonly found intact during excavations compared to the opposite parts of the human skeleton(13). In our study we measured the head length using a spreading calliper and body height was calculated using a stadiometer. Apparently male have higher face length and body height than females. The Face length and the body height increases with increase in age. Spreading calliper was used in this study as same as study done previously. (2)

The morphological structure of head and face shows variations worldwide consistent with ethnic background, environmental factors, and even to the habitats of the populations. Structural differences could even be observed between the individuals within the same population(14). As correlation coefficients between head and face dimensions and body height can change consistent with different head and face types, we began to gauge the correlation coefficients for people who belong to a

particular head or face type (15). However, when correlation coefficients were evaluated after the sample was divided into subgroups consistent with head or face types, no significant changes were observed in comparison with the whole sample.

Especially in endogamous populations, correlation coefficients for head and face dimensions and stature are high, and thus applicable for identification within the forensic field(16). This is often presumably the main reason for the high correlation coefficients calculated by the researchers. Studies on Japanese, South African, and Italian populations indicated significant correlations between cephalometric measurements and stature. The Turkish population may be a considerably mixed population composed of people from several ethnic origins (17). This is often probably the main reason for the low correlation coefficients between head and face dimensions and stature.Our team has extensive knowledge and research experience that has translated into high quality publications (18),(19),(20),(21),(22),(23),(24),(25),(26),(27),(28),(29),(30),(31),(32),(33),(34),(35),(36),(37).

CONCLUSION:

This study showed a positive significant correlation between body length and head length. Head length is a reliable indicator in estimation of height. The prediction of height from incomplete and decomposed cranial remains is important in establishing the identity of unknown individuals in incidents of murders, accidents or natural disasters.

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CONFLICT OF INTEREST: Nil

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REFERENCES:

1. Pawłowski B. Body Height [Internet]. Encyclopedia of Body Image and Human Appearance. 2012. p. 82–8. Available from: http://dx.doi.org/10.1016/b978-0-12-384925-0.00014-6

2. Manandhar B, Shrestha R. Estimation of Body Height from Head Length among Dental Students of a Dental College. JNMA J Nepal Med Assoc. 2018 Sep;56(213):861–5.

3. Lundy JK. The mathematical versus anatomical methods of stature estimate from long bones [Internet]. Vol. 6, The American Journal of Forensic Medicine and Pathology. 1985. p. 73–6. Available from: http://dx.doi.org/10.1097/00000433-198503000-00013

4. Bhatnagar DP, Thapar SP, Batish MK. Identification of personal height from the somatometry of the hand in Punjabi males. Forensic Sci Int. 1984 Feb;24(2):137–41.

5. Raxter MH, Auerbach BM, Ruff CB. Revision of the Fully technique for estimating statures. Am J Phys Anthropol. 2006 Jul;130(3):374–84.

6. Stewart TD. Essentials of Forensic Anthropology, Especially as Developed in the United States. Charles C. Thomas Publisher; 2014. 325 p.

7. Sendroy J, Julius C, A. H. DETERMINATION OF HUMAN BODY VOLUME FROM HEIGHT AND WEIGHT [Internet]. 1965. Available from: http://dx.doi.org/10.21236/ad0628948

8. Burton R. The Sitting-Height Index of Build, (Body Mass)/(Sitting Height)3, as an Improvement on the Body Mass Index for Children, Adolescents and Young Adults [Internet]. Vol. 5, Children. 2018. p. 30. Available from: http://dx.doi.org/10.3390/children5020030

9. Pelin C, Duyar İ, Kayahan EM, Zağyapan R, Muhteşem Ağildere A, Erar A. Body Height Estimation Based on Dimensions of Sacral and Coccygeal Vertebrae [Internet]. Vol. 50, Journal of Forensic Sciences. 2005. p. 1–4. Available from: http://dx.doi.org/10.1520/jfs2004010

10. Giroux CL, Wescott DJ. Stature estimation based on dimensions of the bony pelvis and proximal femur. J Forensic Sci. 2008 Jan;53(1):65–8.

11. Chiba M, Terazawa K. Estimation of stature from somatometry of skull. Forensic Sci Int. 1998 Nov

9;97(2-3):87–92.

12. Patil KR, Mody RN. Determination of sex by discriminant function analysis and stature by regression analysis: a lateral cephalometric study [Internet]. Vol. 147, Forensic Science International. 2005. p. 175–80. Available from: http://dx.doi.org/10.1016/j.forsciint.2004.09.071

13. Ryan I, Bidmos MA. Skeletal height reconstruction from measurements of the skull in indigenous South Africans. Forensic Sci Int. 2007 Mar 22;167(1):16–21.

14. Mohanty NK. Prediction of height from percutaneous tibial length amongst Oriya population [Internet]. Vol. 98, Forensic Science International. 1998. p. 137–41. Available from: http://dx.doi.org/10.1016/s0379-0738(98)00144-3

15. V S, Sangeetha V, Khan TA. Prediction of Height from Percutaneous Tibial Length [Internet]. Vol. 8, National Journal of Basic Medical Sciences. 2018. p. 127–30. Available from: http://dx.doi.org/10.31975/njbms.2018.8301

16. Zorab PA, Harrison A, Harrison WJ. ESTIMATION OF HEIGHT FROM TIBIAL LENGTH [Internet]. Vol. 284, The Lancet. 1964. p. 1063. Available from: http://dx.doi.org/10.1016/s0140-6736(64)91017-7

17. Silva FM, Figueira L. Estimated height from knee height or ulna length and self-reported height are no substitute for actual height in inpatients [Internet]. Vol. 33, Nutrition. 2017. p. 52–6. Available from: http://dx.doi.org/10.1016/j.nut.2016.08.011

18. 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 Dec;14(S 01):S105–9.

19. Mathew MG, Samuel SR, Soni AJ, Roopa KB. Evaluation of adhesion of Streptococcus mutans, plaque accumulation on zirconia and stainless steel crowns, and surrounding gingival inflammation in primary molars: randomized controlled trial. Clin Oral Investig. 2020 Sep;24(9):3275–80.

20. Sridharan G, Ramani P, Patankar S, Vijayaraghavan R. Evaluation of salivary metabolomics in oral leukoplakia and oral squamous cell carcinoma. J Oral Pathol Med. 2019 Apr;48(4):299–306.

21. R H, Hannah R, Ramani P, Ramanathan A, Jancy MR, Gheena S, et al. CYP2 C9 polymorphism among

patients with oral squamous cell carcinoma and its role in altering the metabolism of benzo[a]pyrene [Internet]. Vol. 130, Oral Surgery, Oral Medicine, Oral Pathology and Oral Radiology. 2020. p. 306–12. Available from: http://dx.doi.org/10.1016/j.oooo.2020.06.021

22. Antony JVM, Ramani P, Ramasubramanian A, Sukumaran G. Particle size penetration rate and effects of smoke and smokeless tobacco products - An invitro analysis. Heliyon. 2021 Mar 1;7(3):e06455.

23. Sarode SC, Gondivkar S, Sarode GS, Gadbail A, Yuwanati M. Hybrid oral potentially malignant disorder: A neglected fact in oral submucous fibrosis. Oral Oncol. 2021 Jun 16;105390.

24. Hannah R, Ramani P, WM Tilakaratne, Sukumaran G, Ramasubramanian A, Krishnan RP. Author response for “Critical appraisal of different triggering pathways for the pathobiology of pemphigus vulgaris—A review” [Internet]. Wiley; 2021. Available from: https://publons.com/publon/47643844

25. Chandrasekar R, Chandrasekhar S, Sundari KKS, Ravi P. Development and validation of a formula for objective assessment of cervical vertebral bone age. Prog Orthod. 2020 Oct 12;21(1):38.

26. Subramanyam D, Gurunathan D, Gaayathri R, Vishnu Priya V. Comparative evaluation of salivary malondialdehyde levels as a marker of lipid peroxidation in early childhood caries. Eur J Dent. 2018 Jan;12(1):67–70.

27. Jeevanandan G, Thomas E. Volumetric analysis of hand, reciprocating and rotary instrumentation techniques in primary molars using spiral computed tomography: An in vitro comparative study. Eur J Dent. 2018 Jan;12(1):21–6.

28. Ponnulakshmi R, Shyamaladevi B, Vijayalakshmi P, Selvaraj J. In silico and in vivo analysis to identify the antidiabetic activity of beta sitosterol in adipose tissue of high fat diet and sucrose induced type-2 diabetic experimental rats. Toxicol Mech Methods. 2019 May;29(4):276–90.

29. Sundaram R, Nandhakumar E, Haseena Banu H. Hesperidin, a citrus flavonoid ameliorates hyperglycemia by regulating key enzymes of carbohydrate metabolism in streptozotocin-induced diabetic rats. Toxicol Mech Methods. 2019 Nov;29(9):644–53.

30. Alsawalha M, Rao CV, Al-Subaie AM, Haque SKM, Veeraraghavan VP, Surapaneni KM. Novel

mathematical modelling of Saudi Arabian natural diatomite clay. Mater Res Express. 2019 Sep 4;6(10):105531.

31. Yu J, Li M, Zhan D, Shi C, Fang L, Ban C, et al. Inhibitory effects of triterpenoid betulin on inflammatory mediators inducible nitric oxide synthase, cyclooxygenase-2, tumor necrosis factor-alpha, interleukin-6, and proliferating cell nuclear antigen in 1, 2-dimethylhydrazine-induced rat colon carcinogenesis. Pharmacogn Mag. 2020;16(72):836.

32. Shree KH, Hema Shree K, Ramani P, Herald Sherlin, Sukumaran G, Jeyaraj G, et al. Saliva as a Diagnostic Tool in Oral Squamous Cell Carcinoma – a Systematic Review with Meta Analysis [Internet]. Vol. 25, Pathology & Oncology Research. 2019. p. 447–53. Available from: http://dx.doi.org/10.1007/s12253-019-00588-2

33. Zafar A, Sherlin HJ, Jayaraj G, Ramani P, Don KR, Santhanam A. Diagnostic utility of touch imprint cytology for intraoperative assessment of surgical margins and sentinel lymph nodes in oral squamous cell carcinoma patients using four different cytological stains. Diagn Cytopathol. 2020 Feb;48(2):101–10.

34. Karunagaran M, Murali P, Palaniappan V, Sivapathasundharam B. Expression and distribution pattern of podoplanin in oral submucous fibrosis with varying degrees of dysplasia – an immunohistochemical study [Internet]. Vol. 42, Journal of Histotechnology. 2019. p. 80–6. Available from: http://dx.doi.org/10.1080/01478885.2019.1594543

35. Sarode SC, Gondivkar S, Gadbail A, Sarode GS, Yuwanati M. Oral submucous fibrosis and heterogeneity in outcome measures: a critical viewpoint. Future Oncol. 2021 Jun;17(17):2123–6.

36. Raj Preeth D, Saravanan S, Shairam M, Selvakumar N, Selestin Raja I, Dhanasekaran A, et al. Bioactive Zinc(II) complex incorporated PCL/gelatin electrospun nanofiber enhanced bone tissue regeneration. Eur J Pharm Sci. 2021 May 1;160:105768.

37. Prithiviraj N, Yang GE, Thangavelu L, Yan J. Anticancer Compounds From Starfish Regenerating Tissues and Their Antioxidant Properties on Human Oral Epidermoid Carcinoma KB Cells. In: PANCREAS. LIPPINCOTT WILLIAMS & WILKINS TWO COMMERCE SQ, 2001 MARKET ST, PHILADELPHIA …; 2020. p. 155–6.