



Measurement of height from the length of hand: A cross-sectional study among medical students of North India

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Abstract

Introduction: Height is considered as one of important parameters for personal identification. Stature reconstruction can provide forensic anthropological estimation of height of a person in living state which plays a vital role in identification of individual remains. There is a strong correlation of height with hand dimensions and if either of measurements is known, other can be calculated.

Aim: The aim of present study was to find association of hand length with height and to show if height could be predicted using hand length measurements in medical students. **Methodology:** This was Crosssectional study done among 97 students of a Medical College. Students with no deformities or previous history of trauma to spine or hand were included in study. The anthropometric characteristics including height and hand length were measured, analysed statistically and correlation between parameters was studied. **Results:** Out of 97, 50.5% were males and 49.5% females. Mean height among females was 156.38 ± 4.796 cm, left hand length 17.02 ± 0.838 cm and right hand length was 17.08 ± 0.821 cm. The mean height among males was 170.02 ± 5.811 cm, left and right hand length was 18.89 ± 0.928 and 18.83 ± 0.955 cm respectively. The results show statistical significant differences between the anthropometric parameters ($p < 0.00$). Positive correlation was found between height and hand length indicating that height could be predicted using hand length. **Conclusion:** Statistical significant relation was observed between hand length and height in present study. We can predict height from hand length when it is difficult or not possible to measure height directly.

Key Words: Height, Hand Length, Anthropometry, Medical College

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Introduction:

Identification of sex, age, race and height is the most important aspect of any forensic investigation. Height is considered as one of the most important parameters for personal identification. The stature of an individual is an inherent characteristic; its estimation is considered to be an important assessment in the identification of unknown human remains(1). Stature is one of the criteria for establishing identification of the person/dead body(2).

The use of anthropometry in the field of forensic science & medicine dates back to 1882, when Alphonse Bertillon (a French police expert) invented a system of criminal identification based on anthropometric measurements(3). Body height could be

measured from the dimensions of legs, arms, pelvis etc. The contribution of each of these variables to the total height varies in different individuals and also in different populations. The estimation of height is a significant parameter in the identification of skeletal and mutilated remains in forensic examination(4). There exists a strong positive correlation of stature with hand dimensions and if either of the measurements is known, the other can be calculated. The relation between height and hand length was described for the first time by Marcus Vitruvius Polliono (BC) and popularized by Leonardo da Vinci's 'Vitruvius Man' from 1487. Hand length is an attractive alternative for estimating body height, as it is easier to measure than other anthropometrical indicators used to estimate



body height such as ulna length or knee height. The hand is more accessible, its measurement requires a minimum of motion and cooperation by the individual and can be obtained without the necessity of mobilizing the patient, causing practically no discomfort(5).

Wherever, prediction of a dependent variable is needed, there comes the role of regression analysis. Height was predicted from hand and phalanges length in an Egypt based study, using a linear regression model by Habib SR.

Materials and Methods:

Study design:Cross- sectional study

Setting:Department of Anatomy in GMC Kathua .

Duration of study: Three months,from 1stseptember to 1st December 2021.

Study participants :97 students of 1st year MBBS, among which 48 were females and 49 were males between the ages of 17 to 21 years of Govt. Medical College-Kathua.

Inclusion criteria:Medical students aged between 17 to 21 years with no deformities or previous history of trauma to spine or hand.

Exclusion criteria:

1. Students with body deformity or trauma were excluded from the study.
2. Students who did not give consent

Data collection procedure:

After receiving the Ethical Committee approval of Institutional Ethical Committee, the data collection procedure was commenced after taking informed consent. The measurements were taken with the aid of pretrained lab. technicians. Diurnal variations were avoided by taking measurements between 11A.M. to 12P.M. daily. Hand length has been measured by different methods in different studies but we followed the method adopted by study of Subina S and SudikshyaKC(7) in medical students in Nepal. The measurements were taken as follows:

Hand length:

Each participant was instructed to place his /her hands supine on a flat hard horizontal surface with fingers extended and adducted. Then the hand length (HL) of both hands, right and left, was measured by an inch tape from the midpoint of the distal crease of wrist joint to the distal end of the most anterior projecting point that is tip of the middle finger.

Height measurement:

It was measured to the nearest centimeters (cms) using a standard stadiometer with subject standing erect on a horizontal resting plane bare footed having the palms of the hands turned

Jee SC derived multiple regression equations for height prediction and found that hand length was the most accurate predictor of stature (6).

The aim of present study is to find the correlation between hand length and height. This study also aims to derive a regression equation for prediction of height and then cross validate it for the measurement of its effectiveness. As very few studies of this type have been conducted in northern parts of India so this study was conducted.



inwards and the fingers pointing downwards. The height was the measurement between the vertex and the feet as recommended by International Biological programme 7.

Data collection tools:

Stadiometer, inch tape, questionnaire for collection of personal details, stationary etc. Data collected were tabulated, graphically represented and statistically analyzed

Data entry and analysis: The data was entered in excel sheet and analyzed by SPSS version 22. Proportions and mean with standard deviation were calculated. Chi-square test was used to find a difference in proportions. A p value of <0.05 is considered significant. Correlation was also calculated.

Results:

Our study consisted of 97 subjects, out of which 49 were males and 48 were females. Mean lengths between the two sides were compared and it was found to be 17.96± 1.249 for right hand and 17.97± 1.285 for left hand (p<0.00).

Table 1 shows statistically highly significant positive correlation between height and hand length of right and left (p<0.00). This study reveals that hand length of both sides was also significantly more in those having more stature. Through the linear regression equation Height=61.194+5.689*hand length right and Height=62.543+5.606*hand length left. We are able to estimate height by the known value of hand length. Height and hand length was significantly more in males as compared to females (figures 1,2)

Table 1. Correlation of hand length and stature								
Variables	Minimum	Maximum	Range	Mean	SD	N	Correlation	p value
Height(cm)	147	181	34	163.27	8.670	97		
Hand length right(cm)	14	21	7	17.96	1.249	97	r=0.818	p<0.00
Hand length left(cm)	14	21	7	17.97	1.285	97	r =0.831	p<0.00
Linear regression equation	Height=61.194+5.689*hand length right							
Linear regression equation	Height=62.543+5.606*hand length left							



Table 2. Gender wise comparison of parameters			
Variables	Male(N= 49) Mean±SD	Female(N=48) Mean±SD	P value and significance
Age(years)	19.76+1.031	19.69+0.803	0.300
Hand length right	18.83± 0.955	17.08± 0.821	<0.00
Hand length left	18.89± 0.928	17.02± 0.838	<0.00
Height	170.02± 5.811	156.38± 4.796	<0.00

Table 2 shows statistically very highly significant differences in hand length (right and left) and height between males and females (p<0.00).

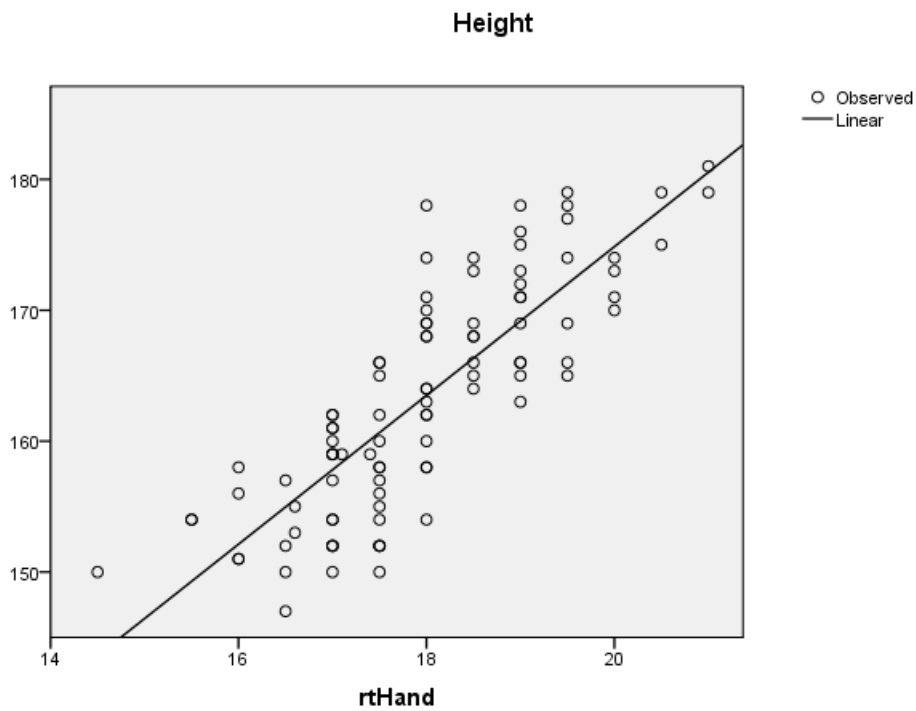


Fig 1 : Scatter plot showing relation between height and hand size(right hand)



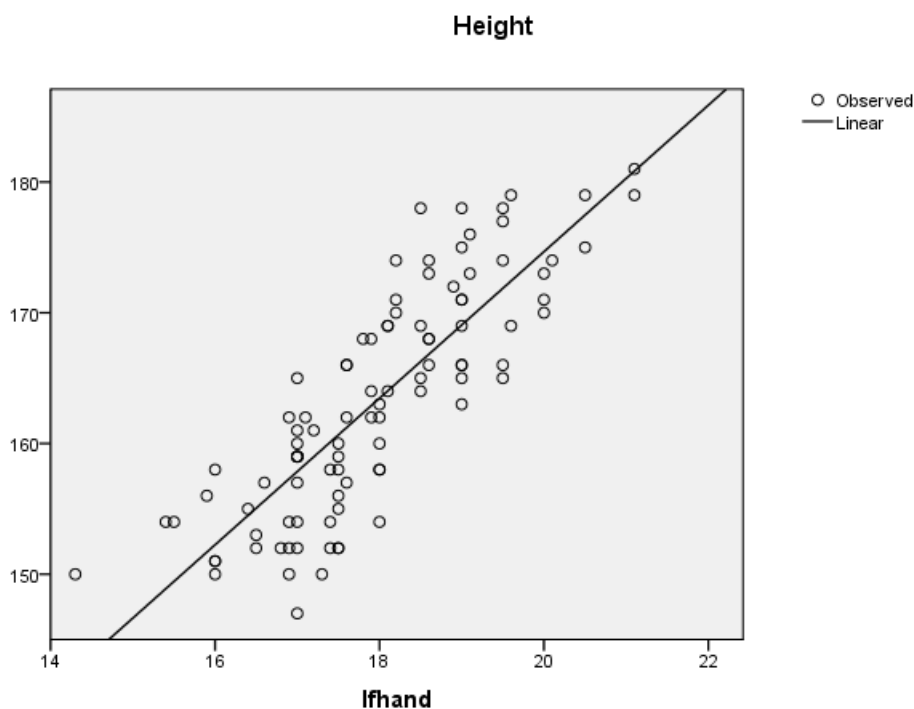


Fig 2 : Scatter plot showing relation between height and hand size(left hand)

Discussion:

The present study was done to find the relationship between height and hand length. In our study, human stature was found to be ranged between 147cm to 181cm . Mean stature was 163.27 cm with SD of 8.670. These findings corresponded closely with similar studies done on Indian population by Patel et al(8), Chikhalkar et al.(9); Mohite PM et al.,(10) & Nath S et al.,(11).

In our study Hand length on right side was found to be ranging from 14cm to 21cm with mean of 17.96 cm and SD of 1.249. Also left hand length ranged from 14cm to 21cm with mean of 17.97 cm and SD of 1.285. These findings correspond closely with studies done by Oommen et al(12); Shankar et al (13); Charmode et al & Ibrahim et al (14).

Gender related comparison of hand dimensions was done and found them to be significantly more in males as compared to females. These findings were similar to the findings from the studies done by Dey &

Kapoor(15);Oomen et al(12)&Charmode et al.(1)

Correlation coefficient ‘r’ calculated for hand length (right :r =0.818 , left :r = 0.831). A strong correlation was observed in present study between human height and hand length similar to findings of charmode SH et al (right:r=0.493, left: r=0.524); Chikhalkar et al (r=0.5902); Patel et al (r=0.806).(1,8,9)

Linear regression equation calculated in the present study corresponds with that calculated in previous studies like Charmode et al {height(h)=63.186+4.782*hand length(right), height(h)=68.786*hand length(left)}; Shanker et al{male:y=7.96+(0.061*right hand length), female: y=10.49+(0.04*left hand length)}; Mohite et al {height(h)=65.60+0.54* head length }(1,10,13)

Conclusion:

In our study statistical significant relation was observed between hand length and height in the present study. We can predict height from



hand length when it is difficult or not possible to measure height directly. The linear regression formula can also be derived for adult aged between 17 to 21 years. This information can be of use to forensic, epidemiological and anthropometric studies.

Limitations:

This study was done on young subjects aged 17 to 21 years only. So it can not be generalised to old aged persons and small children.

References:

1. Charmode SH, Kadlimath HS, Pujari D. Correlation of human height with hand dimensions: a study in young population of central India. *Int. J. Hum. Anat.* 2019;1(3):36-44.
2. Kaur M, Singh B, et al. Anthropometric measurements of hand length for estimation of stature in North Indians. *Int. J. Appl. Biol. Pharm Tech.* 2013;4(2):251-55.
3. Krishan K. Anthropometry in forensic medicine and forensic science- 'forensic Anthropometry'. *The Int. J. Forensic sci.* 2006;2(1).
4. Waghmare V, Gaikwad R, Herekar N. Estimation of the stature from the Anthropometric Measurement of Hand length. *Int. J. Anthropol.* 2010;4(2):1-5.
5. Guerra RS, Fonseca, Pichel F, Restivo MT and Amaral TF. Hand length as an alternative measurement of height. *Eur J. of clin nutr.* 2014;68: 229-233.
6. Zafar u, Rahman SU, Hamid N, Ahsan J, Zafar N. Correlation between height and hand size, and predicting height on the basis of age, gender and hand size. *J of Med Sci*;25(4):425-428.
7. Shrestha Subina and KC Sudikshya. Anthropometric measurement of

hand dimension and their correlation with height in undergraduate students of a medical college in Nepal. *J. Lumbini Med. Coll.* 2020;8(1):5

8. Patel PN, Tanna JA, Kalele SD. Correlation between Hand length and various Anthropometric parameters. *Int. J. of Med. Toxicol. Forensic Med.* 2012;2(2):61-63.
9. Chikhalkar BG, Mangaonkar AA, Nanandkar SD, Peddawat RG. Estimation of stature from measurements of long bones, hand and foot dimensions. *J. Indian Acad. Forensic Med.* 2009;32(4):329-330.
10. Mohite PM, Keche AS, Mohite DP, Keche HA. Correlation of the dimensions of hand & feet with stature of an individual: A study on central Indian Adults. *J. Indian Acad. Forensic Med.* 2015;37(2):160-164.
11. Nath S, Garg R, Krishan G. Estimation of stature through percutaneous measurements of upper and lower limbs among male Rajputs of Dehradun. *J. Indian Anthropol. Soc.* 26:245-249.
12. Oomen A, Mainker A, Oomen T. A study of the correlation between hand length and foot length in humans. *J. Anat. Soc. India* 2005;54(2):55-57.
13. Shanker GS, Shanker VV, Radhika K, Shetty S. Correlation of human height with hand length in Indian individuals. *Int. J. Anat, Res* 2017;5(4.1):4478-4481.
14. Ibrahim MA, Khalifa AM, Hassan HA, Tamam HG, Hagraas AM. Estimation of stature from hand.
15. Dey S & Kapoor AK. Hand length and hand breadth: A Study of Correlation Statistics among human population. *Int. j . sci. Res.* 2015; 4(4):148-150.

