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Original Research Article

The study of correlation between palm length, palm width and hand length with stature in the students

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ABSTRACT

Introduction: To determine sex, age, race, stature and nutritional status of an individual, the hand dimensions, which are different in various races and ethnic groups are used, also they are used in the mass disaster for an identification of sex, age, race and stature.
Aim: The present study was designed to determine and correlate of the hand dimensions such as hand length, palm length, palm width with stature of student and to observe the standard deviation in the estimation of stature.
Materials and Methods : This was descriptive cross sectional study conducted at Department of Forensic Medicine & Toxicology, Vedantaa Institute of Medical Sciences, Town Dahanu, Dist- Palghar, Maharashtra State, India. from 1^{st} Dec 2022 to 30^{th} June 2023.
After ethical permission; total 101 male and 98 female between age group of 20-23 years were enrolled in the study by simple random method. In a group of 10 number the height of participants was measured with a stature meter whereas, measuring tape and Vernier caliper were used to measure palm length, palm width, height of hand respectively and all the data was recorded and analysed by SPSS; S/W version 21. Linear regression coefficient was calculated.
Results : The person correction for statistic. The mean length of right hand was recorded to be 170.8mm while mean breadth was 76.7mm. The highest correlation was observed to be exhibited by right hand length (r=0.5) and the lowest by right-hand breadth
Conclusion: The study conclude that, if only the hand length or width measurement is available stature could be successfully estimated. This study also reveals the strong positive relation between palm length, palm width,hand length with stature.

1. Introduction

Anthropologists, medical scientists, and anatomists for over a hundred years have used anthropometric techniques for stature and bone length estimation from unknown body parts and skeletal remains.[1] Thus to solve crimes the relationships between different body dimensions can be utilized in the absence of complete evidence. Forensic scientist use this relationship to calculate stature from mutilated and dismembered body parts in forensic examinations. In the clinical settings for nutrition and health research stature is used very commonly, which is indeed a very important indicator of growth and development. Stature along with body weight used to calculate, body mass index, basal metabolic rate, basal energy expenditure, vital capacity, body composition and estimations of nutrient requirements.[2]

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The victims of mass disasters and fatal assaults can be identified by stature measurement.[3]

To determine sex, age, stature and nutritional status of an individual, the hand dimensions, being genetically derived, varies in different races and ethnic groups are used.[4]

To determine sex, age, stature and nutritional status of an individual. The hand dimensions, being genetically derived varies in different races and ethnic groups are used.[5]

In case of mass disaster identification of sex, age, race and stature is the most important aspect of investigations.[2–4]

2. Aims and Objectives

1. To determine the palm length and width as well as hand length of enrolled subjects.
2. To determine height of enrolled subjects.
3. To find the correlations between palm length ,palm width and hand length with stature of enrolled subjects.

3. Materials and Methods

3.1. Study design

This was descriptive cross-sectional study.

3.2. Study duration

Months, from 1st Dec 2022 to 30th June 2023

3.3. Styudy settings

Department of Forensic Medicine & Toxicology, Vedantaa Institute of Medical Sciences, town Dahanu, Dist- Palghar, Maharashtra state, India.

3.4. Sample size

Male and 98 female between age group of 20-23 years

3.5. Sampling method

Simple random sampling method.

3.6. Ethical aspect

Institutional ethics committee permission has been taken.

3.7. Inclusion criteria

Medical students aged between 17 and 21 years in the Vedantaa Institute of Medical Sciences,town Dahanu, Dist-Palghar, Maharashtra state, India.

3.8. Exclusion criteria

Participants with missing limbs, chronic illness, those with poorly defined wrist creases, deformities of vertebral column & limbs, hormonal therapy, contractures history of trauma to hand and foot, with features suggestive of dysmorphic syndromes were excluded from the study.[4,6]

3.9. Sample selection

After having the institutional ethics committee permission and after satisfying the inclusion criteria, a simple random sampling method was used to select 102 male and 98 female from study location.

3.10. Data collection procedure

After taking informed consent forms from all the enrolled subjects, the data collection procedure was started. Daily measurements were taken specifically between 1-2 pm to avoid diurnal variation. Measurements were scientifically taken for three times and average has been included in the data sheet.

There are many methods to measure hand dimensions, the present study have followed the method adopted by study of Mohite et al.[6] in Central Indian population.

3.11. Palm length and width measurements

On a plain paper every subject was asked to place his / her hand and the palm was advised to face upwards keeping the fingers close together with the thumb lying comfortably but not tightly against the radial aspect of the hand and index finger (Figures 1 and 2).

A lead pencil was used to trace the hand .The tracing proceeded from the radial styloid process to the ulnar styloid process. A line designated as the inter-styloid line was drawn joining the two styloid tips. Hand length (L) was measured using a Vernier Slide Calipers as the distance between the distal crease of wrist to tip of middle finger.[7]

Figure 1. Hand Breadth: Measured from 1st metacarpo-phalangeal joint to base of 5th metacarpal in cm using Vernier Caliper.[7]

Measurement of hand length (in mm) with a sliding caliper. The Stylion radiale, i.e. the tip of the styloid process of the radius and the Daktylion, i.e. the tip of the middle finger served as anthropological landmarks.

3.12. Length

Measured from the tip of the longest finger to the crease under the palm. Breadth: measured across the widest area where the fingers join the palm. Circumference: measured around the palm of your dominant hand, just below the knuckles, excluding the thumb.

The child's shoes and any hats or hair ornaments are removed. The child faces away from the wall with the heels together and the back as straight as possible. The head, shoulders, buttocks, and heels should be in contact with the vertical surface. With the child looking straight ahead, the head projection is placed at the crown of the head. The child

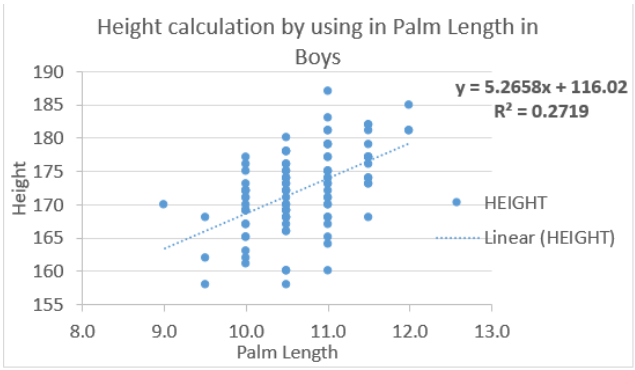
steps away from the wall, and the height measurement is recorded to the nearest 0.1 cm.

3.13. Height

Measured to the nearest centimeters (cm) using a Stadiometer with subject standing erect on a horizontal resting plane bare footed having the palms of the hands turned inward and the finger pointing downwards (Figure 3). The height was measured from the sole of the feet to the vertex of the head as recommended by International Biological Program.

3.14. Data collection tools

Vernier slide calipers, Calibrated foot board, Stadiometer, Regular weight machine, Questionnaire for collection of personal details, academic scores, Lead pencils, stationary etc. Data collected were tabulated, graphically represented and statistically analyzed.



Graph 1: Height calculation by using in palm length in boys

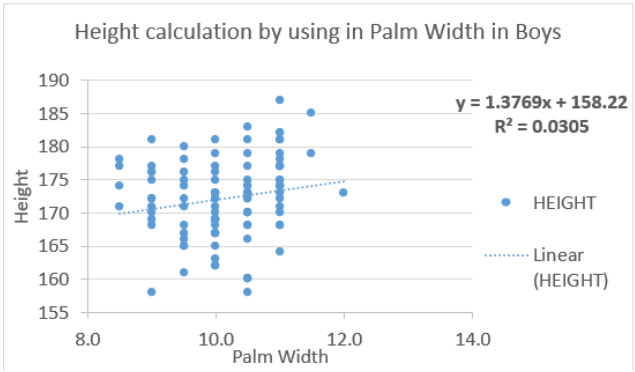
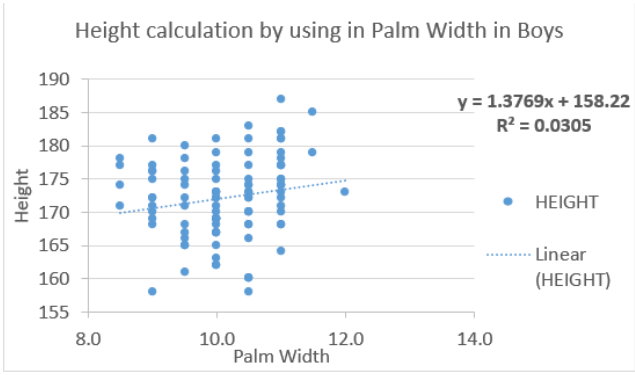


Diagram 1: Height calculation by using in palm width in boys

4. Result

Table 1 and Table 2 shows that mean Heights Palm length and their standard deviation value. In the study it was found



Graph 2: Height calculation by using in palm width in boys

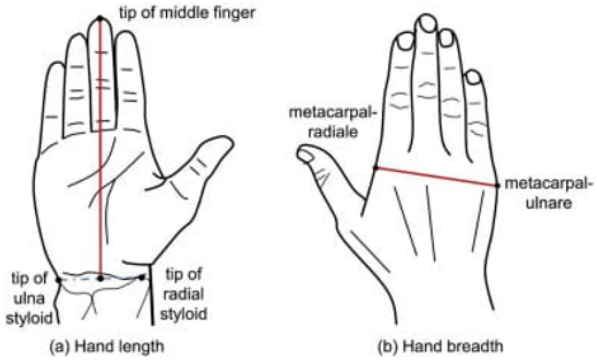


Figure 1: Tip of middle finger

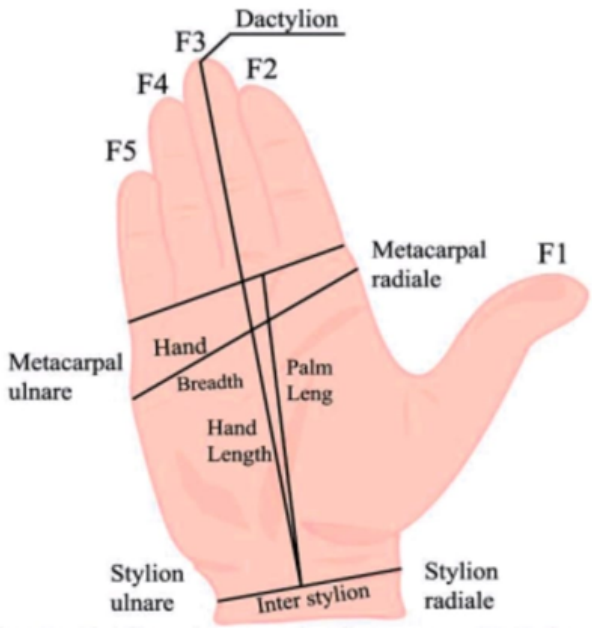


Figure 2: Finfer length, Distance between proximal flexion crease and the tip finger

Table 1: Descriptive statistics - Boys

	Mean	Std. Deviation	N
Height	172.17	6.022	101
Palm Lenghth	10.663	.5963	101
Palm Width	10.129	.7637	101
Hand Length	18.698	.8399	101

Correlations - BOYS

		Height	Palm length	Palm width	Hand length
Height	Pearson Correlation	1	.521**	.175	.502**
	P value		.000	.081	.000
	N	101	101	101	101
Palm length	Pearson Correlation	.521**	1	.447**	.803**
	P value	.000		.000	.000
	N	101	101	101	101
Palm width	Pearson Correlation	.175	.447**	1	.435**
	P value	.081	.000		.000
	N	101	101	101	101
Hand length	Pearson Correlation	.502**	.803**	.435**	1
	P value	.000	.000	.000	
	N	101	101	101	101

**. Correlation is significant at the 0.01 level (2-tailed).

Table 2: Descriptive statistics - Girls

	Mean	Std. Deviation	N
Height	159.43	7.061	98
Palm length	9.33	1.306	98
Palm width	9.31	8.188	98
Hand length	16.69	1.107	98

Correlations: Girls

		Height	Palm length	Palm width	Hand length
Height	Pearson Correlation	1	.432**	.024	.695**
	P value		.000	.811	.000
	N	98	98	98	98
Palm Length	Pearson Correlation	.432**	1	-.017	.526**
	P value	.000		.867	.000
	N	98	98	98	98
Palm Width	Pearson Correlation	.024	-.017	1	-.026
	P value	.811	.867		.800
	N	98	98	98	98
Hand Length	Pearson Correlation	.695**	.526**	-.026	1
	P value	.000	.000	.800	
	N	98	98	98	98

**. Correlation is significant at the 0.01 level (2-tailed).

that mean height of 101 males was 172.17 with standard deviation of 6.022 and mean height of 98 female is 1509.43 with standard deviation of 7.061.the mean right hand length of female was 16.69 with standard deviation of 1.1 07 and that of males was 18.698 with standard deviation of 0.8399.the mean Palm length of males was 10.663 which standard deviation of 0.593 and that of females was 9.3 t with standard deviation of 1.306 the mean Palm which of males was 10.1 to 9 .33 with standard deviation of 0.7637 and that of females is 9.13 with standard deviation of 8.188.

Chart 123 shows relation between Palm length and height Palm width and height hand length with height in males.

Chart 456 shows relation between pamland Palm with Palm hand length with height in girls we can observe that stretcher increase with increase in Palm land Palm weight and hand length in all charts this established is a linear correlation between height and Palm length Palm with and hand length.

Figure 3: Measurement of palm length

Figure 4: Measurement of palm width

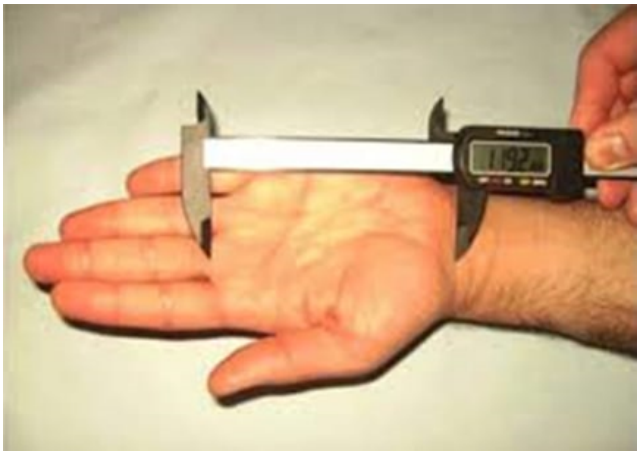


Figure 5: Measurement of palm length

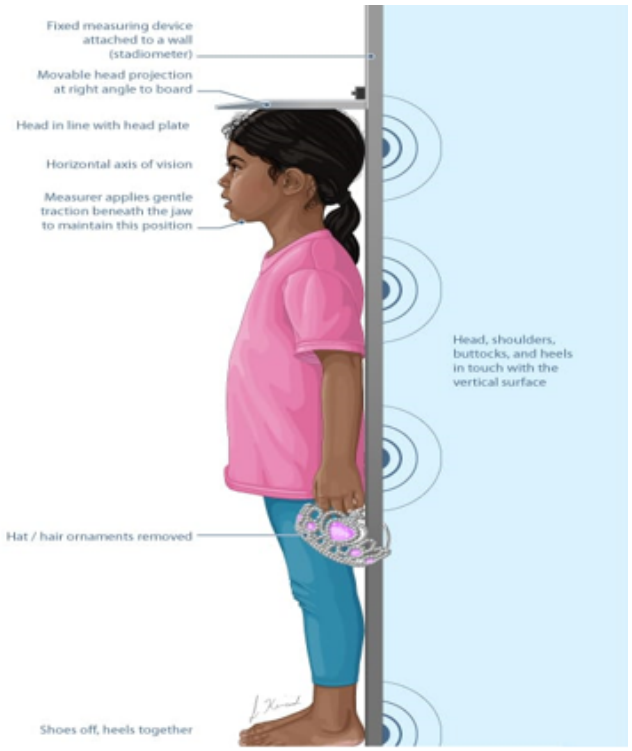


Figure 6: Measurement of strature (Source: https://www.researchgate.net/figure/Radius-metacarpal-angle-was-measured-with-the-subjects-hand-in-a-supinated-position_fig1_344510198)

5. Disscussion

Prediction of the stature of any person is a crucial aspect of forensic examination and anthropological studies.[8] Teacher provides important evidence in forensic investigation process of the establishment of personal identification.[9] Anthropologist have always been a particulars interest to assess the stature of an individual from different elements of body and. However different parts of body and stature differ between human population.[10,11] From India Krishna predicted stretcher from cephalo facial dimensions in North Indian population.[7] Rastogi also estimated stature from hand anthropometry of North and South Indian.[12] In present study total 199 subjects were studied for estimation of stature from hand length in both the sexes. It's odd that mean value for hand parameters in males were larger then that of female with statistically significant difference. There was no statistically significant difference in bilateral hand parameters in both males and females subject with supported by the studies[13] from the results of the present

study it when be concluded that the hand dimensions can be successfully used for estimating stretcher of adult aged between 18 to 25 in western Maharashtra in forensic practice by enforcement Agencies and forensic scientist the present study has provided the regression equations from hen dimension that can be used for estimating stretcher of Western Maharashtra population in Maharashtra India this equation should not be used for other Indian population groups.

6. Conclusion

There exists a significant and positive correlation between palm length, palm width , hand length and strature between both the sexes indicating strong and reliable relationship between the four parameters. Regression equation for strature estimationfrom hand length were formulated and checked for their accuracy by comparimg the estimated strature and the actual strature. The results indicate that hand length,palm length and palm width provides an acurate and reliable means in reconstructing the strature.

7. Source of Funding

None.

8. Conflict of Interest

None.

References

1. Anil K, Bhat R, Jindal AM. The influence of ethnic differences based on upper limb anthropometry on grip and pinch strength. *J Clin Orthop Trauma*. 2021;p. 101504. doi:10.1016/j.jcot.2021.101504.
2. Pal A, De S, Sengupta P, Maity P. Estimation of stature from hand dimensions in Bengalee population, West Bengal, India. *Egypt J Forensic Sci*. 2016;6(2):90–8.
3. Kanchan T, Krishan K, Sharma A, Menezes RG. A study of correlation of hand and foot dimensions for personal identification in mass disasters Tanuj Kanchan 1, Kewal Krishan, Abhilasha Sharma. *Forensic Sci*. 2010;199(1-3):112–3.
4. Charmode S, Kadlimatti HS, Pujari D. Correlation of Human Height with Hand Dimensions: A Study in Young Population of Central India. *Int Jf Hum Anatomy*. 2019;1(3):36–44.
5. Hans H, Boer S, Blau T, Delabarde L. The role of forensic anthropology in disaster victim identification (DVI): recent developments and future prospects. *Forensic Sci Res*. 2019;4(4):303–15.
6. Raxter MH, Ruff CB, Azab A, Erfan M, Soliman M. Stature estimation in ancient Egyptians: a new technique based on anatomical reconstruction of stature. *Am J Phys Anthropol*. 2008;136(2):147–55.
7. B DB. 2008.
8. Rastogi P, Nagesh KKR, Yoganarasimha. 2008.
9. Ozaslan A, Işcan IY, Ozaslan H, Tuğcu S, Koç. 2003.
10. Verma R, Krishan K, Rani D, Kumar A, Sharma V. Stature estimation in forensic examinations using regression analysis: A likelihood ratio perspective. *Forensic Sci Int Rep*. 2020;2. doi:100069.
11. Krishan K. Estimation of stature from cephalo facial anthropometry in North indian population. . *Forensic Sci Int*. 2008;181(1-3):1–6.
12. Ozaslan A, Ozaslan H, Tuğcu S. Estimation of stature from body parts. *Forensic Sci Int*. 2003;132(1):40–5.
13. Rastogi P, Nagesh KR, Yoganarasimha K. Estimation of stature from hand dimensions of north and south Indians. *Leg Med*. 2008;10(4):185–9.

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