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Gender based Correlation between Hand measurement and Height in Medical Students of Shaheed Mohtarma Benazir Bhutto Medical University, Larkana, Sindh

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ABSTRACT

Anthropometry was an organized measurement procedure used in physical anthropology. Hand dimensions can represent an individual's identity. Stature, a complex of linear dimensions, correlates with various body parts. **Objective:** To explore the gender-wise correlation between hand measurement and stature across a diverse population for estimating the stature of MBBS Medical Students of Shaheed Mohtarma Benazir Bhutto Medical University, Larkana, Sindh. **Methods:** It was descriptive cross- sectional study and its sample size was calculated by using Open-epi online calculator. Non convenience sampling method adopted while collecting the data. Research invitations were extended to MBBS students of SMBBMU to participate in a research project and only 354 voluntarily agreed to participate out of which 169 (47.7%) males and 185 (52.3%) females fulfilled the inclusion criteria and written informed consent were taken before proceeding of data collection. **Results:** For both males and females, hand breadth measurements were strongly correlated with each other. The height of hands was also strongly correlated between left and right hands, particularly in males. Those who were involving age or overall height, were generally weaker and not always statistically significant. Males show more significant and stronger correlations between hand measurements and other variables compared to females, who have some significant but generally weaker correlations. **Conclusion:** The findings underscore that taller individuals generally possess larger hand dimensions, and marked differences exist in hand measurements between males and females.

INTRODUCTION

Allah subhanutaallah said in Quran in surat teen, we have indeed created man in the best of moulds" and in another surah (al-Sajdah 32:7). Man creation from clay commenced by Allah Subhanutallah and He Who created all the things perfect way. Beautiful creation of human beings and anthropometric measurements research is essential to focus on comprehensive biological variations according to human variations in different populations. Its essential knowledge about genetic makeup, nutritional habits, and growth trends can be achieved through information and measurement of the human body with the help of anthropometry [1]. Allah Subhanutaallah created every human as unique, and their identity is essential for recognizing the important task in forensic sciences; one of the common and authenticated tools in identification is the biometric and facial recognition techniques in which

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fingerprinting techniques are surest method of identification along with DNA techniques for their rapid and secure authenticated identification of a person. It further included prime importance at the crime scenes with their physiological parameters and auxiliary aids in palatal rugae pattern, lip printing, bite marks, and different dermatoglyphics patterns, which are also paramount for individualizing human identification [2-4]. Anthropometry, an organized measurement procedure used in physical anthropology, is a scientific approach for assessing the size of live bodies and skeletal remains. Stature, age, race, and sex are important anthropological factors in forensic medicine and contemporary science [5]. Stature estimation is vital in forensic examinations, particularly for unidentified remains that are decayed or fragmented or mutilated remains.it also plays a role in establishing personal and physical identity and could be affected by genetically makeup, puberty onset, nutritional factors along with its activity levels [6, 7]. In cases of natural calamity, terrorist activities, road or railway accidents and in war times role of identification have a paramount importance in this field of forensic medicine so pertinent to create various methods which can helps to estimate accurately identification. Forensic pathologists' experts must evaluate both identity and height of the subject which is also pertinent for examination of archeological skeletal remains. Furthermore, accurate weight and height measurements play a key role in assessing setting in educational settings along with patients' health and nutritional status [5-12]. Forensic science places great importance on estimating stature for personal identification [7, 10]. Every part of the human body is interconnected, foot and hand dimensions can represent an individual's identity [10]. Stature or height of the individual depended on various complex or variety of linear dimensions which helps to correlates with various different body parts. Previous research has highlighted relationships between stature and features like the face, head, feet, hands, lower limbs, and vertebral column. Mathematical and anatomical methods are used to establish stature standards. Height prediction can be identified with different methodical algorithms including topor LS, bayleyPinneau, roche-wainer –thissen and khamis roche methods [13, 14]. For Constructive personal identification forensic sciences prioritized the stature with age and sex. Considering the vertebral column, skull, pelvis, and lower extremities, it's evident that a significant relationship exists between stature and all body parts [11, 12]. Across a range of demographics, researchers have continuously discovered a relationship between height and hand measurements. It has been noted that there are global variations in the correlation between hand length and height among various ethnic groups [12, 15, 16]. Despite the fact that several research has been done, there is a dearth of them in the Larkana region.

This study aimed to determine the gender based anthropometric relationship between stature and hand measurement in medical students of MBBS.

METHODS

The study originated on 19 December 2022, when SMBBU granted the permission through institutional review board letter no. SMBBU/ORIC-33. Study data collected during the month of January-March, 2023. It was a descriptive cross-sectional study, and sample size was calculated by using a sample size online calculator. Data were collected through the non-convenience sampling method. This sample size ensures that the study results were reliable and that the true population value will lie within a 95% confidence interval with a margin of error of ±5%. By using the population proportion of 36% the calculated sample size ensures robust statistical power. If a proportion was unknown, using p value =0.5 would give the most conservative estimate, resulting in a larger sample size. However, since p-value > 0.05 was already specified, the sample size was smaller but still statistically valid. For quantitative parameters, normality of data was assessed through Shapiro Wilk test and based on the results parametric or non-parametric tests were applied. Research invitations were extended to MBBS students of SMBBMU to participate in a research project and only 354 voluntarily agreed to participate out of which 169 (47.7%) males and 185(52.3%) females fulfilled the inclusion criteria, and written informed consent was taken before proceeding with data collection. Inclusion criteria include male or female participants of any age who gave their permission, had no history of hand bone fractures, and no congenital hand malformations. And those participants who had a history of hand bone fractures with any congenital hand deformities or who did not consent to participate were excluded from the study. Participants were informed about the study protocols, and personal identifiers were removed before data collection. Data were entered in a pre-designed written proforma, which included the socio-demographic information along with the different anthropometric measurements of participants, including height, hand size in different dimensions, etc. For the measurement of stature, every participant was asked to stand in the anatomical position with bare feet while their height was measured using a stadiometer. Whereas, hand lengths were measured in centimeters(cm) from the transverse crease of the wrist to the distal end of the middle finger, representing the longest length of the hand. For measurement of hand length, Vernier calipers were used. The collected data was entered and analyzed using SPSS version 27.0. General descriptive test mean, standard deviation, and standard error mean

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were calculated, and an independent sample t test and correlation analysis were carried out.

RESULTS

A total of 354 MBBS students participated in this study, in which 169 (47.7%) males and 185 (52.3%) females participated. Table 1 demonstrated the larger mean values in males as compared to females. The mean values of right hand breadth in males highlighted the 9.254 ± 1.361 cm and left hand breadths 9.253 ±1.371 cm and in females mean values 8.525 ± 0.606 cm in right hand breadths and 8.502 ± 0.5859 cm observed in left hand breadths. Females exhibited smaller standard errors (right: 0.04; left: 0.04) as compared to males (right: 0.10; left: 0.11), indicating greater consistency. Height of right hand males was 19.575 ± 1.074 cm and Left hand height 19.651 ±1.084 cm, while females had a mean of right hand 17.76 ± 1.25 cm, and a mean of left hand 17.849 ± 1.02 cm. The mean values for female age 21.29 ± 2.691 and males showed 22.28 ± 6.503 years. The Standard error among the genders was lower in females 0.198 in comparison with male group 0.50, which demarcated the additional variability in males.

Table 1: Gender based Variation of Hand Measurements

Variables	Gender	N	Mean ± SD	Standard Error Mean	p-value
Right Hand Breadth	Male	169	9.254 ± 1.361	0.105	<0.0001
	Female	185	8.525 ± 0.606	0.045	< 0.0001
Left Hand Breadth	Male	169	9.253 ± 1.371	0.106	<0.0001
	Female	185	8.502 ± 0.586	0.043	< 0.0001
Height of Right Hand	Male	169	19.575 ± 1.074	0.083	<0.0001
	Female	185	17.765 ± 1.250	0.092	< 0.0001
Height of Left Hand	Male	169	19.651 ± 1.085	0.083	< 0.0001
	Female	185	17.849 ± 1.024	0.075	< 0.0001
Age	Male	169	22.28 ± 6.503	0.500	<0.068
	Female	185	21.29 ± 2.691	0.198	<0.068

Table 2 of independent t-test demarcated amongst groups of male and female for comparing of hand dimensions and age variation, independent sample t-test was applied with 95% confidence interval and p-Value $p < 0.001$ was considered as significant. It was demarcated that a significant difference in right hand breadth between the groups, $t(227.50) = 6.405$, $p < 0.001$, with a mean difference of 0.729 with 95% CI (0.505, 0.953) which suggested that one group had significantly wider right hands than the other left hand breadth, $t(223.07) = 6.598$, $p < 0.001$, with a mean difference of 0.751 with 95% CI (0.527, 0.976). This indicated a statistically significant greater breadth in one group's left hands compared to the other. The t-test showed a significant difference in the height of the right hand between the groups, $t(352) = 14.535$, $p < 0.001$, with a mean difference of 1.8097 units (95% CI: 1.565, 2.055). This demonstrated a significant variation in right hand height between the two groups height of left hand the t-test showed a significant difference in left hand height, $t(352) = 16.080$, $p < 0.001$, with a mean difference of 1.802 units, 95% CI (1.5819, 2.0227). This indicated a statistically significant difference in left hand height between the groups.

Table 2: Independent Samples Test

Variables		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Signifiant	T	df	Significant (2-tailed)	Mean Difference	Standard Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Right Hand Breadth	Equal variances assumed	4.210	0.041	6.602	352	0.000	0.729	0.110	0.511	0.946
	Equal variances not assumed	-	-	6.405	227.499	0.000	0.729	0.114	0.505	0.953
Left Hand Breadth	Equal variances assumed	6.665	0.010	6.808	352	0.000	0.751	0.110	0.535	0.946
	Equal variances not assumed	-	-	6.598	223.065	0.000	0.751	0.114	0.527	0.976
Height of Right Hand	Equal variances assumed	0.043	0.836	14.535	352	0.000	1.809	0.125	1.5649	2.0546
	Equal variances not assumed	-	-	14.635	350.703	0.000	1.810	0.124	1.5665	2.0530
Height of Left Hand	Equal variances assumed	2.276	0.132	16.080	352	0.000	1.802	0.112	1.5819	2.0227
	Equal variances not assumed	-	-	16.038	344.445	0.000	1.802	0.112	1.5813	2.0233
Age	Equal variances assumed	1.076	0.300	1.893	352	0.059	0.986	0.521	-0.038	2.011
	Equal variances not assumed	-	-	1.833	219.758	0.068	0.986	0.538	-0.074	2.046

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Table 3 of correlation highlighted correlation among gender with hand dimensions and hand dimensions and with age. Male and female correlations with hand dimensions highlighted significant negative Pearson's correlation like in right hand breadth -0.332, -0.332, -0.332 and in left hand breadth -0.341 -0.341 -0.341, both were significant at p <0.001.strong positive correlations of right and left hand breadths (r = 0.956, r = 0.956, r= 0.956, p<0.001p < 0.001p<0.001) and between the correlation of heights of both hands (r=0.821r = 0.821r=0.821, p<0.001p < 0.001p<0.001) suggestive of there were closely related with each other. Weak correlations of age were observed with the hand dimensions and significant correlations with height of the hand (r=0.167r = 0.167r=0.167 and r=0.162r = 0.162r=0.162, both p=0.002p = 0.002p=0.002).

Table 3: Correlations of Gender with Hand Dimensions

Variables		Gender	Right Hand Breadth	Left Hand Breadth	Height of Right Hand	Height of Left Hand	Age
Gender	Pearson Correlation	1	-0.332**	-0.341**	-0.612**	-0.651**	-0. 100
	Significant (2-Tailed)	-	0.000	0.000	0.000	0.000	0. 059
	N	354	354	354	354	354	354
Right Hand Breadth	Pearson Correlation	-0.332**	1	0.956**	0.402**	0.454**	0. 043
	Significant (2-Tailed)	0.000	-	0.000	0.000	0.000	0.418
	N	354	354	354	354	354	354
Left Hand Breadth	Pearson Correlation	-0.341**	0.956**	1	0.390**	0.443**	0.0 46
	Significant (2-Tailed)	0.000	-	0.000	0.000	0.000	0.389
	N	354	354	354	354	354	354
Height of Right Hand	Pearson Correlation	-0.612**	0.402**	0.390**	1	0.821**	0.1 67**
	Significant (2-Tailed)	0.000	-	0.000	0.000	0.000	0.0 02
	N	354	354	354	354	354	354
Height of Left Hand	Pearson Correlation	-0.651**	0.454**	0.443**	0.821**	1	0.1 62**
	Significant (2-Tailed)	0.000	-	0.000	0.000	0.000	0.0 02
	N	354	354	354	354	354	354
Age	Pearson Correlation	-0.100	0.043	0.046	0.167**	0.162**	1
	Significant (2-Tailed)	0.059	0.418	0.389	0.002	0.002	-
	N	354	354	354	354	354	354
**Correlation is Significant at the 0.01 Level (2-Tailed)							

DISCUSSION

The pivotal role of identification in anthropometric studies highlighting the different body aspects for importantly crucial practical applications especially in normal physiological and forensic sciences. Revolutionary aspects of Identification through different gadgets in detecting identity and helping in identification from skeletal remains. Ergonomic and industrial designs may also benefit to relative size dimensions which helps to create various tools and gloves and multiple products to fit comfortably and with better functionality [11, 12, 14]. For improving patient care in medicine it can be useful for diagnosing certain conditions and ensuring custom fit prosthetic and apparel [15]. It also contributes in sports science, anthropological studies and various educational efforts enhancing the designs of personalized products [16]. This study demonstrated correlation of hand breadth with anthropometric measurements which revealed very realistic outcomes for males and female's participants. Strong positive correlation amongst the right hand breadth and left hand breadth in males (r=0.956, r = 0.956, r=0.956, p<0.001, p< 0.001, p<0.001) which suggested that both hands exhibited very similar dimensional characteristics, demonstrating that an increase in the breadth of one hand was likely to be mirrored by an increase in the other. P-value < 0.001 demonstrated in correlation significance seen in the right and left hand breadth with the height of right hand and left hands which highlighted broader hands which inclined to be interlaced with the taller hands. Height and heights of right and left hands also showed positive significant associations which demonstrated taller individuals inclined with proportionally larger extremities. Similar type of results was also seen in north and south Indian which was supportive for these results [17]. Another studies on Nigerian populations by which also highlighted relationships of height and hand length and supports [18]. Right and left hand breadth association with the age demonstrated weak correlation but height of the hand demonstrated a significant correlation. Gender and hand measurements of negatively significant association highlighting the proportions of male and female hands were different from each other. Such findings also dependable with another studies in Pakistan, India, Columbia, Nigeria supports the same results with men had bigger hand sizes as compared to females [19]. Age association with height also demonstrated any significance p-value >0.002. Such type of results also supported by Egyptians, Indian and Nigerian population studies [20]. The strong correlation between right and left hand breadths observed in this study highlighted the bilateral symmetry of hand measurements. Such symmetry was expected given the anatomical and functional similarities of the hands. Contrary to some expectations, age showed weak and non-significant correlations with hand dimensions. This indicated that within the age group of the samples, age does not significantly impact these anthropometric traits. This was in line with the study by Habib and Kamal (2010), which found minimal age-related changes in hand dimensions among Egyptian adults [20].

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CONCLUSIONS

It was concluded that normal anthropometric parameters significantly different among the gender, and no any significant difference was observed in age variation. Significant difference in hand breadth and height highlighted males had larger hand dimensions as compared to females. Such insights can be helpful for various fields like forensic science, ergonomic designs, and personalized health care, which insisted on further research for practical implications.

Authors Contribution

Conceptualization: HR, FAA
Methodology: HR, FAA, MGAT, NAQ
Formal analysis: HR, FAA, SAFK
Writing, review and editing: HR, MGAT, SAQ, SAFK, NAQ

All authors have read and agreed to the published version of the manuscript

Conflicts of Interest

All the authors declare no conflict of interest.

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REFERENCES

[1] Sinha P, Chakraborty S, Balakrishnan MC, Das S, Banerjee I.Exploring craniofacial anthropometry in the ethnic adult population of Meghalaya, Northeast India: A Cross-Sectional Study. 2024 Oct; 76(5): 4200-4207. doi: 10.1007/s12070-024-04814-5.

[2] Taneja C and Jain LK. Stature Estimation from the Anthropometric Measurements of Hands in Tribal Population of Udaipur District by Regression Analysis. International Journal of Health Sciences and Research. 2014; 4(11): 117-22.

[3] Abeer Zubair Khan1 , Nusrat Jahan2,*, Mahboobul Haque1Estimation of stature based on hand length among students of Uttar Pradesh Khan, Jahan and Haque / Indian Journal of Clinical Anatomy and Physiology 2020; 7(3): 271-276 2. doi: 10.18231/j.ijcap.2020.054.

[4] Zafar U, Rahman SU, Hamid N, Zafar N, Ahsan J. Correlation between height and hand size, and predicting height on the basis of age, gender and hand size.Journal of Medical Sciences. 2017 Dec; 25(4): 425-8.

[5] Dikshit PC, Aggrawal A, Rani M. Estimation of stature from hand length. Journal of Indian Academy of Forensic Medicine. 2005; 27(4): 219-21.

[6] Asghar MJ, Butt M, Akbar A, Azam H, Zahra I. Stature prediction of Punjab population (Pakistan) from hand, forearm and foot measurements. Biological and Clinical Sciences Research Journal.2020;57.doi: 10.54112/bcsrj.v2021i1.57.

[7] Norton K, Olds T. Role of anthropometry in athlete performance and sports science. Journal of Sports Sciences. 2021; 39(1): 1–13. doi: 10.1080/02640414.2020.1853711.

[8] Topor LS, Feldman HA, Bauchner H, Cohen LE. Variation in methods of predicting adult height for children with idiopathic short stature. Pediatrics. 2010 Nov; 126(5): 938-44. doi: 10.1542/peds.2009-3649.

[9] Khamis HJ and Roche AF. Predicting adult stature without using skeletal age: the Khamis-Roche method. Pediatrics. 1994 Oct; 94(4): 504-7.

[10] Moreno JC. Advancements in anthropometry for prosthetic limb design. Prosthetics and Orthotics International. 2020; 44(5): 385–94. doi: 10.1177/0309364620933451.

[11] Krishan K, Kanchan T. Hand anthropometry and its application in forensic science: A review. Journal of Forensic and Legal Medicine. 2023; 95: 102506.

[12] Sharma S. Forensic Science, Age Estimation, Open Apex, Panoramic Radiographs [Doctoral Dissertation]. Rajiv Gandhi University of Health Sciences; 2023.

[13] Rani M, Gupta S. Hand breadth and height correlation in a North Indian population. International Journal of Anatomy and Research.2020; 8(3.2): 7635–9. doi: 10.18231/j.ijcap.2020.005.

[14] Gomez AM, Molero JE. Hand anthropometry and its relationship with stature and age in a Colombian population. Journal of Anthropological Sciences. 2019; 97: 61–70.

[15] Stojanovic E, Scanlan A. Influence of anthropometry on performance outcomes in elite athletes: A review. Sports Medicine. 2020; 50(3): 525–38. doi: 10.1007/s40279-019-01229-2.

[16] Ibeabuchi NM, Akpuaka FC, Okereke HC. Correlation between hand length and height in young Nigerian adults. International Journal of Medical Science and Health Research. 2018; 2(7): 24–9.

[17] Al-Asadi JN. Handgrip strength in medical students: Correlation with body mass index and hand dimensions. Asian Journal of Medical Sciences.2018 Jan; 9(1): 21-6. doi: 10.3126/ajms.v9i1.18577.

[18] Supare M, Pandit S, Bagul A. Estimation of stature from hand length and hand breadth in medical students of Maharashtra, India. International Journal of Health & Allied Sciences.2015 Jul; 4(3): 154. doi: 10.4103/2278-344X.160875.

[19] Aboul-Hagag KE, Mohamed SK, El-Shafy AM. Bilateral symmetry of hand dimensions and its relationship to

DOI: https://doi.org/10.54393/pjhs.v5i12.1954

body size in a sample of Egyptian population. Forensic Science International.2011; 206(1-3): 216.e1–8. doi: 10.1016/j.forsciint.2010.09.025.

[20] Habib SR and Kamal NN. Stature estimation from hand and phalanges lengths of Egyptians. Journal of forensic and legal medicine.2010 Apr; 17(3): 156-60. doi :10.1016/j.jflm.2009.12.004.