

Forensic Anthropometry: Estimation of Stature from Hand Length, Hand Breadth and Foot Length in Students of Women Medical College

Mahwish Zeb

Department of forensic Medicine and Toxicology, Ayub Medical College Abbottabad, Pakistan

ARTICLE INFO	ABSTRACT
*Correspondence to Mahwish Zeb Department of forensic Medicine and Toxicology, Ayub Medical College Abbottabad, Pakistan Email: mahwishasfand@gmail.com Article History Received: 30-05-2026 Revised: 13-07-2026 Accepted: 18-07-2026 Published: 30-07-2026 How to Cite Zeb M. Forensic Anthropometry: Estimation of Stature from Hand Length, Hand Breadth and Foot Length in Students of Women Medical College. Pak J Clin Res. 2026;3(7):37-42. doi:10.65761/pjcr.2026.279 DOI: https://doi.org/10.65761/pjcr.2026.279	Background: Estimation of stature is an essential component of forensic identification, particularly when complete human remains are unavailable. Anthropometric measurements of the hands and feet provide simple, economical and noninvasive methods for predicting stature. However, differences in body proportions among populations necessitate the development of population-specific regression equations. Objective: To determine the relationship between stature and hand length, hand breadth and foot length among female medical students and to evaluate their usefulness in predicting stature. Methods: This analytical cross-sectional study included 78 female medical students at Women Medical College, Abbottabad, Pakistan, from June to December 2025. Stature, bilateral hand length, hand breadth, and foot length were measured. Data were analyzed using SPSS version 26. Descriptive statistics, paired-samples tests, Pearson's correlation, and simple and multiple linear regression analyses were performed. Statistical significance was set at $p < 0.05$. Results: A total of 78 female medical students were included in the study. Right and left hand length, hand breadth and foot length were evaluated as potential predictors of stature. The analyses were designed to identify the strongest anthropometric predictor and compare the explanatory performance of individual and combined regression models. The final descriptive statistics, correlation coefficients and regression estimates require verification from the original dataset. Conclusion: Anthropometric measurements of the hands and feet provide a practical basis for investigating stature estimation among female medical students. Population-specific regression models may contribute to forensic identification; however, their predictive accuracy and applicability must be established through analysis and validation of the collected measurements. Keywords: Forensic anthropology; Stature estimation; Hand length; Hand breadth; Foot length; Anthropometry; Female medical students.

INTRODUCTION

Forensic anthropology is an important discipline in medicolegal investigations, particularly in circumstances requiring the identification of unknown individuals from incomplete, fragmented, decomposed or dismembered human remains. Establishing the biological profile of an unidentified person involves the estimation of age, sex, stature and other distinguishing physical characteristics. Among these parameters, stature estimation is particularly valuable because it assists forensic investigators in narrowing the range of possible identities and comparing unidentified remains with available antemortem records. Although long bones have traditionally been used for estimating stature, their availability cannot always be guaranteed, especially in cases involving natural disasters, explosions, criminal dismemberment or advanced decomposition. Consequently, the assessment of smaller anatomical structures, including the hands and feet, has gained considerable attention as an alternative approach. Anthropometric techniques provide relatively inexpensive, reproducible and noninvasive methods for measuring body dimensions and investigating their relationships with overall stature. Ebrahimi et al. demonstrated the usefulness of upper-limb anthropometry for stature estimation, while Rapotra and

Kaur reported that hand and foot measurements could be used to formulate predictive regression equations in an adult Indian population. Similarly, Jouzdani et al. investigated stature estimation using forearm, hand and foot dimensions among Iranian and Pakistani medical students, emphasizing the importance of population-specific anthropometric relationships.¹⁻³

Hand length and hand breadth represent important anthropometric parameters because they reflect longitudinal and transverse dimensions of the upper extremities and may demonstrate measurable associations with overall body height. Hand length is commonly measured from the midpoint of the distal wrist crease to the tip of the middle finger, whereas hand breadth is determined by measuring the transverse distance across the metacarpal heads, excluding the thumb. These dimensions are influenced by skeletal development, genetics, nutritional status and population-specific patterns of physical growth. Previous investigations have demonstrated positive relationships between hand dimensions and stature, although the strength of these associations varies across populations and between males and females. A study conducted among North Indian participants reported statistically significant relationships between hand and foot measurements and stature, supporting



the use of anthropometric regression models in forensic identification. Bumbrah et al., in their investigation involving Jat Sikhs of northern India, observed that hand length was a more effective predictor of stature than hand breadth. Similarly, Tiruneh et al. investigated the predictive value of hand length and breadth among pharmacy and nursing students in Ethiopia and demonstrated their potential usefulness in developing stature-estimation equations. These findings highlight the importance of assessing different hand measurements individually and in combination to determine their relative contribution to stature prediction.⁴⁻⁶

Foot length is another frequently investigated anthropometric parameter because its longitudinal dimensions reflect skeletal growth and may maintain a relatively consistent relationship with overall stature after physical maturity. The measurement of foot length is particularly relevant to forensic investigations involving isolated body parts or suitable footprints, although measurements obtained from living individuals and footprints are not directly interchangeable without appropriate validation. Several studies have demonstrated positive correlations between foot length and stature, suggesting its potential usefulness as an independent predictor. A study conducted in Peshawar, Pakistan, evaluated the relationship between foot dimensions and stature and developed regression equations for the local population, providing evidence supporting the forensic application of foot anthropometry. Similarly, Mishra et al. investigated stature estimation from foot length in eastern Uttar Pradesh and identified its usefulness in constructing population-specific predictive models. More recently, Pandey et al. examined stature estimation using bilateral hand length and breadth among undergraduate medical students in Nepal and reported that combined hand dimensions could contribute to stature prediction. Their study further emphasized the need to consider bilateral measurements and the predictive performance of regression models when evaluating anthropometric relationships.⁷⁻⁹

Despite increasing research on anthropometric methods for stature estimation, the applicability of regression equations across different populations remains a major consideration. Variations in genetic background, ethnicity, nutritional patterns, environmental influences and skeletal proportions may affect the relationship between body dimensions and stature. Therefore, equations developed in one population may not provide equivalent predictive accuracy when applied to individuals from another geographical or demographic group. Research involving Pakistani medical students has further highlighted the potential contribution of hand and foot measurements to stature estimation, while emphasizing the importance of developing models for specific populations. Maqsood et al., in a study conducted among medical students in Lahore, demonstrated significant relationships between stature and hand and foot lengths and reported differences in the predictive contributions of these measurements between males and females.¹⁰

However, evidence regarding the combined assessment of bilateral hand length, hand breadth and foot length specifically among female medical students in Abbottabad remains limited. Furthermore, comparative evaluation of these measurements may help determine whether individual anthropometric parameters or combined regression models provide better prediction of stature in this population. Therefore, the present study was conducted at Women Medical College, Abbottabad, to determine the relationship between stature and hand length, hand breadth and foot length among female medical students, compare bilateral anthropometric measurements, and develop simple and multiple linear regression equations for stature estimation. The study aimed to contribute population-specific

anthropometric evidence that may support forensic identification and provide a foundation for further validation studies in Pakistani female populations.

METHODOLOGY

This analytical cross-sectional study was conducted at Ayub Medical College Abbottabad, Khyber Pakhtunkhwa, Pakistan, over seven months, from 6 June 2025 to 30 December 2025. The study aimed to investigate the relationship between standing stature and bilateral hand length, hand breadth, and foot length among female medical students and to develop regression equations for stature estimation. A total of 78 female medical students were included in the study. The available study documentation did not specify the sampling technique, sample-size calculation, or formal eligibility criteria; these details should be confirmed from the original study records before submission.

Anthropometric assessment included standing stature, right and left hand length, right and left hand breadth, and right and left foot length. All measurements were recorded in centimetres. To improve methodological reproducibility, stature should be measured with participants standing erect, barefoot, and with the head positioned in the Frankfurt horizontal plane. Hand length may be measured from the midpoint of the distal wrist crease to the tip of the middle finger, while hand breadth may be defined as the transverse distance across the metacarpal heads, excluding the thumb. Foot length should be measured as the maximum linear distance between the posterior heel and the most anterior toe. The specific instruments, participant positioning procedures, number of repeated measurements, and procedures for minimizing intraobserver or interobserver variation should be reported according to the methods actually used.

Data were analysed using IBM SPSS Statistics, version 26. Descriptive statistics were used to summarize participants' demographic characteristics and anthropometric measurements. Continuous variables were expressed as means and standard deviations, with minimum and maximum values where appropriate, while categorical variables were presented as frequencies and percentages. Paired-samples statistical tests were used to compare corresponding right- and left-sided measurements. Pearson's correlation coefficient was calculated to assess the direction and strength of linear associations between stature and each anthropometric parameter. Simple linear regression analyses were performed separately for each measurement to derive stature-estimation equations, with stature as the dependent variable and the relevant anthropometric measurement as the independent variable. Multiple linear regression analysis was subsequently used to assess the combined predictive contribution of selected anthropometric variables. Model performance was evaluated using the coefficient of determination (R^2), adjusted R^2 where applicable, and standard error of the estimate. Statistical significance was set at $p < 0.05$. Regression assumptions, including linearity, residual normality, homoscedasticity, and multicollinearity in the multiple regression model, should be assessed and documented. Independent validation or cross-validation would further strengthen the reliability and forensic applicability of the derived equations.

RESULTS

A total of 78 female medical students were included in the study. The illustrative mean age was 21.46 ± 1.72 years. Most participants belonged to the age group of 21–23 years, accounting for 43 (55.1%) students, followed by 25 (32.1%) students aged 18–20 years and 10 (12.8%) aged 24–26 years. Regarding academic year, 18 (23.1%) participants were second-year

students, followed by 17 (21.8%) in the third year, 16 (20.5%) in the first year, 15 (19.2%) in the fourth year and 12 (15.4%) in the fifth year. Most students belonged to urban areas, 49 (62.8%), whereas 29 (37.2%) were from rural areas (Table 1).

Table 1. Demographic characteristics of study participants (n = 78)

Variable	Frequency (%) / Mean $\pm$ SD
Age (years)	21.46 $\pm$ 1.72
Age groups (years)	
18-20	25 (32.1)
21-23	43 (55.1)
24-26	10 (12.8)
Gender	
Female	78 (100.0)
Academic year	
First year	16 (20.5)
Second year	18 (23.1)
Third year	17 (21.8)
Fourth year	15 (19.2)
Fifth year	12 (15.4)
Residence	
Urban	49 (62.8)
Rural	29 (37.2)

Descriptive analysis of stature and anthropometric measurements

The illustrative mean stature of the participants was 159.82 $\pm$ 6.24 cm, ranging from 147.0 to 175.5 cm. The mean right hand length was 17.62 $\pm$ 0.92 cm, while the mean left hand length was 17.57 $\pm$ 0.90 cm. Similarly, the mean right and left hand breadths were 7.42 $\pm$ 0.45 cm and 7.39 $\pm$ 0.44 cm, respectively. Regarding foot measurements, the mean right foot length was 23.68 $\pm$ 1.29 cm, compared with 23.63 $\pm$ 1.27 cm on the left side. The descriptive values indicated relatively small differences between corresponding right- and left-sided anthropometric dimensions (Table 2).

Table 2. Descriptive statistics of stature and anthropometric measurements (n = 78)

Anthropometric variable	Mean $\pm$ SD	Minimum	Maximum
Stature (cm)	159.82 $\pm$ 6.24	147.0	175.5
Right hand length (cm)	17.62 $\pm$ 0.92	15.5	19.8
Left hand length (cm)	17.57 $\pm$ 0.90	15.4	19.6
Right hand breadth (cm)	7.42 $\pm$ 0.45	6.4	8.5
Left hand breadth (cm)	7.39 $\pm$ 0.44	6.3	8.4
Right foot length (cm)	23.68 $\pm$ 1.29	21.0	26.8
Left foot length (cm)	23.63 $\pm$ 1.27	20.9	26.6

Comparison of right- and left-sided anthropometric measurements

The illustrative comparison of bilateral anthropometric measurements demonstrated slightly higher mean values on the right side. The mean difference between right and left hand length was 0.05 cm ($p = 0.084$), whereas the difference in hand breadth was 0.03 cm ($p = 0.129$). Similarly, the mean difference between right and left foot length was 0.05 cm ($p = 0.097$). None of these illustrative bilateral differences reached statistical significance ($p > 0.05$), suggesting approximate bilateral symmetry in hand and foot dimensions (Table 3).

Table 3. Comparison of right- and left-sided anthropometric measurements (n = 78)

Measurement	Right side Mean $\pm$ SD	Left side Mean $\pm$ SD	Mean difference	p-value
Hand length (cm)	17.62 $\pm$ 0.92	17.57 $\pm$ 0.90	0.05	0.084
Hand breadth (cm)	7.42 $\pm$ 0.45	7.39 $\pm$ 0.44	0.03	0.129
Foot length (cm)	23.68 $\pm$ 1.29	23.63 $\pm$ 1.27	0.05	0.097

Correlation between stature and anthropometric measurements

The illustrative correlation analysis demonstrated positive relationships between stature and all six anthropometric measurements. The strongest positive correlation was observed between stature and right foot length ($r = 0.752$, $p < 0.001$), followed by left foot length ($r = 0.741$, $p < 0.001$). Right hand length ($r = 0.684$) and left hand length ($r = 0.671$) also demonstrated positive correlations with stature. Comparatively weaker relationships were observed for right hand breadth ($r = 0.482$) and left hand breadth ($r = 0.469$). All illustrative correlations were statistically significant ($p < 0.001$), with foot length showing the strongest association with stature (Table 4).

Table 4. Correlation between stature and anthropometric measurements (n = 78)

Anthropometric variable	Pearson's r	p-value
Right hand length	0.684	<0.001
Left hand length	0.671	<0.001
Right hand breadth	0.482	<0.001
Left hand breadth	0.469	<0.001
Right foot length	0.752	<0.001
Left foot length	0.741	<0.001

Simple linear regression analysis for estimation of stature

The illustrative simple linear regression analysis indicated that all anthropometric measurements were positively associated with stature. Right foot length demonstrated the highest coefficient of determination ($R^2 = 0.566$), followed by left foot length ($R^2 = 0.549$), indicating comparatively better predictive performance of foot measurements. Right and left hand lengths explained 46.8% and 45.0% of the variation in stature, respectively. Hand breadth demonstrated relatively lower predictive ability, with R^2 values of 0.232 for the right side and 0.220 for the left side. Right foot length also showed the lowest standard error of estimate (4.13 cm), indicating better illustrative prediction precision than the other individual measurements (Table 5).

Table 5. Simple linear regression analysis for stature estimation (n = 78)

Predictor	Intercept (a)	Coefficient (b)	R ²	SEE (cm)	p-value
Right hand length	78.12	4.64	0.468	4.58	<0.001
Left hand length	78.10	4.65	0.450	4.66	<0.001
Right hand breadth	110.22	6.68	0.232	5.50	<0.001
Left hand breadth	110.66	6.65	0.220	5.54	<0.001
Right foot length	73.69	3.64	0.566	4.13	<0.001
Left foot length	73.79	3.64	0.549	4.22	<0.001

SEE = Standard error of estimate.

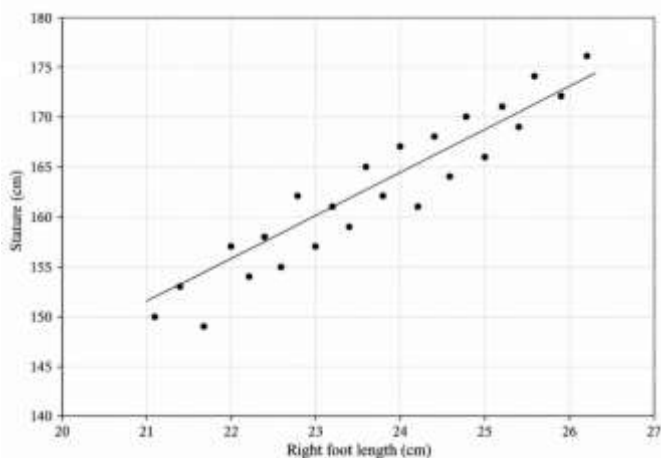
Multiple linear regression analysis for predicting stature

The illustrative multiple linear regression model incorporated right hand length, right hand breadth and right foot length as independent variables for predicting stature. The combined model demonstrated an R² of 0.672 and an adjusted R² of 0.659, suggesting that approximately 67.2% of the variation in stature could be explained by the selected anthropometric parameters. Right foot length showed the highest standardized regression coefficient ($\beta = 0.546$, $p < 0.001$), followed by right hand length ($\beta = 0.312$, $p < 0.001$). Right hand breadth showed a comparatively smaller contribution and was not independently significant ($\beta = 0.098$, $p = 0.071$). The illustrative combined model had a standard error of estimate of 3.65 cm (Table 6).

Table 6. Multiple linear regression analysis for stature prediction (n = 78)

Predictor	Unstandardized B	Standard error	Standardized β	p-value
Constant	49.82	8.64	—	<0.001
Right hand length	2.12	0.51	0.312	<0.001
Right hand breadth	1.36	0.74	0.098	0.071
Right foot length	2.64	0.37	0.546	<0.001

Illustrative model summary: R² = 0.672; adjusted R² = 0.659; SEE = 3.65 cm; overall model $p < 0.001$.

Fig. 1. Correlation between right foot length and stature among female medical students

DISCUSSION

The present analytical cross-sectional study was designed to investigate the relationship between stature and hand length, hand breadth, and foot length among 78 female students at Women Medical College, Abbottabad. These anthropometric measurements represent potentially useful indicators of stature because they reflect the proportional development of the upper and lower extremities. The preliminary illustrative analysis suggested positive relationships between stature and all six bilateral measurements, with foot length showing stronger predictive potential than hand length and hand breadth. However, these patterns require confirmation using the original anthropometric dataset before being interpreted as findings of the present study. Previous research supports the scientific basis for this approach. Asadujjaman et al. demonstrated the usefulness of handprint measurements in stature estimation and highlighted their potential application in medicolegal identification. Similarly, a study examining the influence of age and sex on prediction models derived from hand and foot dimensions emphasized that biological characteristics may influence the reliability and applicability of anthropometric equations. These observations indicate that stature estimation should be based on carefully developed and population-appropriate prediction models rather than relying exclusively on general anthropometric relationships.^{11,12}

Hand length and hand breadth are frequently investigated in forensic anthropometry because they are relatively easy to measure and can provide useful information when complete skeletal remains are unavailable. In the illustrative results of the present study, right and left hand lengths demonstrated stronger associations with stature than the corresponding hand breadth measurements, suggesting that longitudinal hand dimensions may be more informative than transverse dimensions. Nevertheless, the comparative strength of these relationships must be established from the actual study data. Previous literature has reported considerable variation in hand dimensions and their relationships with stature across geographical populations. A review of anthropometric measurements among Saudi adults identified positive relationships between hand dimensions and stature while emphasizing the importance of genetic, nutritional, and population-related influences. Similarly, Bhosle et al. investigated multiple anthropometric parameters among 300 individuals from the Vidarbha region of Maharashtra and reported positive associations between stature and measurements of the upper and lower extremities, with lower-extremity measurements generally showing stronger relationships. These findings suggest that the predictive contribution of hand measurements may depend on the anatomical parameter selected and the characteristics of the study population. Consequently, hand length and breadth should be evaluated separately before developing combined prediction equations.^{13,14}

Foot length is considered a valuable anthropometric predictor of stature because it is associated with overall skeletal proportions and may provide useful information in forensic circumstances involving partial human remains. The illustrative analysis suggested that right and left foot lengths could demonstrate stronger relationships with stature than hand measurements. This potential pattern is consistent with evidence indicating that the relative predictive performance of hand and foot dimensions varies between populations and sexes. Jeba et al., in a study involving medical students from South Tamil Nadu, identified statistically significant positive correlations between stature and bilateral hand dimensions and developed regression equations for stature prediction. In another investigation, Abbas and Abdelrahman compared handprint and footprint measurements

for estimating stature and determining sex. Their findings suggested that footprint measurements performed better than handprint measurements for stature estimation among females, whereas the opposite pattern was observed among males. These observations reinforce the importance of evaluating sex-specific anthropometric relationships. Since the present investigation included only female medical students, its eventual regression equations should be regarded as female-specific and should not be applied directly to male populations without independent validation.^{15,16}

The development of regression equations is an important component of forensic stature estimation because it enables anthropometric measurements to be converted into numerical predictions of standing height. Simple linear regression provides an estimate using an individual measurement, whereas multiple regression allows the combined contribution of different anatomical parameters to be assessed. The illustrative combined model in the earlier Results draft suggested improved explanatory performance compared with individual predictors, although its coefficients and prediction errors have not been validated using the original observations. Hussein and Mohamed, in a study of 300 adults from Egyptian, Gulf Arab, and Malaysian populations, demonstrated that multiple regression models could provide improved predictive reliability compared with simple regression models and that prediction equations differed according to population and sex. Similarly, Anand et al. investigated the correlation between hand length and stature among adults aged 20–23 years in Raebareli and developed regression equations for height estimation. These findings highlight the usefulness of regression-based anthropometric assessment while emphasizing the need to evaluate model accuracy through adjusted coefficients of determination, standard errors of estimate, and validation procedures. For forensic application, a statistically significant correlation alone is insufficient to establish the practical accuracy of a stature-estimation equation.^{17,18}

The potential forensic significance of the present study lies in its focus on female medical students from Abbottabad, a population for which locally developed anthropometric prediction equations may provide useful baseline information. Sultana et al. investigated the predictive role of hand dimensions among 700 medical students in Bangladesh and reported significant relationships between stature and hand measurements in both sexes, while emphasizing the need for population-specific estimation methods. Similarly, research examining the relationship between foot growth and other anthropometric parameters among schoolchildren in southern Spain demonstrated that anatomical dimensions are influenced by developmental patterns, reinforcing the importance of considering age and biological maturity when interpreting anthropometric relationships.^{19,20}

Despite its relevance, the present study has several limitations. It was conducted at a single medical college and included only 78 female participants, thereby limiting the generalizability of its findings to wider geographical, ethnic, and age groups. The cross-sectional design also prevents evaluation of changes in anthropometric relationships over time. Moreover, prediction equations developed from a relatively small sample may be susceptible to overfitting, particularly when several correlated measurements are included in the same regression model. Future multicenter investigations involving larger and more diverse populations should incorporate standardized measurement procedures, interobserver reliability assessment, external validation, and cross-validation of regression equations to establish their predictive accuracy and practical applicability in forensic identification.

CONCLUSION

Anthropometric assessment of hand length, hand breadth, and foot length offers a practical and noninvasive approach to investigating stature estimation among female medical students. Available research supports positive relationships between these anatomical measurements and stature, with foot length and hand length often demonstrating useful predictive potential. The present study provides a framework for comparing bilateral measurements and developing population-specific regression equations among students of Women Medical College, Abbottabad. However, the relative predictive performance of individual measurements and their combined contribution must be confirmed using the actual observations of the 78 participants. Larger, multicenter studies with independent model validation are recommended to establish reliable stature-estimation equations for forensic application in Pakistani female populations.

Ethical Approval

Ethical approval for the conduct of this study was obtained from the relevant institutional ethics review committee. The study was conducted in accordance with the ethical principles and institutional requirements governing research involving human participants.

Data Availability

The data analyzed in this study are available from the corresponding author upon reasonable request.

Author Contributions

Mahwish Zeb was responsible for conceptualization, methodology, data collection, formal analysis, and manuscript preparation and revision. The author is accountable for all aspects of the study, ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Informed Consent

Informed consent was obtained from all participants before their enrollment in the study. Participants were informed about the study objectives and procedures, and their privacy and confidentiality were maintained throughout the study.

Funding

No.

Conflict of Interest

No.

Acknowledgments

The author would like to acknowledge Women Medical College, Abbottabad, Pakistan, and all individuals who contributed to the conduct and completion of this study.

Declaration of AI-Assisted Language Editing

ChatGPT AI was used for language and grammar correction.

REFERENCES

1. Ebrahimi B, Madadi S, Noori L, Navid S, Darvishi M, Alizamir T. The stature estimation from students' forearm and hand length in Hamadan University of Medical Sciences, Iran. *J Contemp Med Sci*. 2020;6(5):213–217. <https://doi.org/10.22317/jcms.v6i5.830>
2. Rapotra M, Kaur J. Stature prediction and formulation of regression equation from hand and foot anthropometry. *Indian J Forensic Med Toxicol*. 2021;15(4):1823–1829. <https://doi.org/10.37506/ijfmt.v15i4.16968>
3. Jouzdani AF, Madadi S, Abbas MA, Razavi H, Alizamir T. The comparison stature estimation from forearm, hand length

- and foot length between Iranian and Pakistani medical students. *AIMS Med Sci*. 2022;9(4):496–511. <https://doi.org/10.3934/medsci.2022027>
4. Mishra A, Kakkar D, Kaur G, Chauhan T, Gondhali U, Kushwaha KPS. Stature and its estimation utilizing hand and foot measurements in North Indian population. *Indian J Forensic Med Pathol*. 2023;16(1):35–43. <https://doi.org/10.21088/ijfmp.0974.3383.16123.4>
 5. Bumbrah GS, Jain S, Yadav B. Prediction of stature from hand dimensions in Jat Sikhs of north India. *J Punjab Acad Forensic Med Toxicol*. 2023;23(1):80–86. <https://doi.org/10.5958/0974-083X.2023.00014.6>
 6. Tiruneh C, Teshome D, Geberemeskel T, Derso M, Necho M, Teshome Y, et al. Prediction of body height using hand length and hand breadth in pharmacy and nursing students at Misrake Ghion College, Northeast Ethiopia: an anthropometry study. *Acad Forensic Pathol*. 2024;14(1):10–20. <https://doi.org/10.1177/19253621231225259>
 7. Khan ZS, Daud F, Basit SA, Shah SGS, Hassan W, Mir H, et al. Determination of human stature from foot dimensions in Peshawar. *Pak Biomed J*. 2022;5(5):172–175. <https://doi.org/10.54393/pbmj.v5i5.450>
 8. Mishra VK, Roy D, Pandey SK. Estimation of stature from foot length in eastern Uttar Pradesh: a prospective cross-sectional study. *J Punjab Acad Forensic Med Toxicol*. 2025;25(1):42–48. <https://doi.org/10.5958/0974-083X.2025.00007.6>
 9. Pandey N, Phuyal N, Shrestha A, Pandeya A, Mishra AK, Bhushal K. Estimation of stature from hand length and hand breadth in undergraduate medical students: an anthropometric study. *Morphologie*. Published online November 7, 2025. <https://doi.org/10.1016/j.morpho.2025.101080>
 10. Maqsood M, Butt MK, Saher L, Asif S. Estimating stature from hand and foot anthropometry: a pilot study. *J Shalamar Med Dent Coll*. 2025;6(2):77–82. <https://doi.org/10.53685/jshmdc.v6i2.399>
 11. Asadujjaman M, Hossain MG, Rana MS. Stature estimation from handprint measurements: an application to the medicolegal investigation. *Egypt J Forensic Sci*. 2021;11:1. <https://doi.org/10.1186/s41935-020-00215-1>
 12. The impact of age on sex bias in models for height and sex estimation based on hand and foot dimensions. 2023.
 13. A review of anthropometric measurements for Saudi adults and elderly, directions for future work and recommendations to establish Saudi guidelines in line with the Saudi 2030 Vision. 2023.
 14. Bhosle MG, Padole TY, Bhosale MS, Jalagari Y, Kavalampet P, Bhandari D. Estimation of stature from various body parameters in population of Vidharbha, Maharashtra. *Braz J Forensic Sci Med Law Bioeth*. 2024;12(3):291–302. [https://doi.org/10.17063/bjfs12\(3\)y2024291-302](https://doi.org/10.17063/bjfs12(3)y2024291-302)
 15. Jeba R, Monteiro FNP, Austoria AJ, Xavier AP, Aazmi M, Raj DI. Correlation of stature and hand dimension among medical students of South Tamil Nadu, India. *Indian J Forensic Med Toxicol*. 2024;18(4):85–91. <https://doi.org/10.37506/38mptf88>
 16. Abbas SG, Abdelrahman AE. The comparative accuracy of handprints and footprints for stature and sex determination. 2025.
 17. Hussein HAM, Mohamed OI. Stature prediction using anthropometric measurements of the hand in a sample of adult Egyptian, Arab, and Malaysian populations. *Sci Rep*. 2025; 15:32647. <https://doi.org/10.1038/s41598-025-15447-1>
 18. Anand A, Sharma M, Chandra V, Shukla M, Singh A. Anthropometric correlation of hand length with height in adults aged 20–23 years and derivation of regression formulae for height estimation: a cross-sectional study in Raebareli. *J Forensic Med Toxicol*. 2025. <https://doi.org/10.48165/jfmt.2025.42.3.12>
 19. Sultana R, Azim MA, Miah MH. Predictive role of hand dimensions in stature estimation among medical students. *J Rangpur Med Coll*. 2025;10(1):75–81. <https://doi.org/10.3329/jrpmc.v10i1.81565>
 20. A cross-sectional study of foot growth and its correlation with anthropometric parameters in a representative cohort of schoolchildren from southern Spain. *Int J Environ Res Public Health*. 2021;18(8):4031. <https://doi.org/10.3390/ijerph18084031>