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Original Article

The Relationship of the Length of the Index and Ring Fingers With The Height of Batak Ethnic

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Background: Identify a person is always a concern, especially in forensic cases such as mass disasters, mutilation, or body parts found in murders, accidents and natural disasters. Several techniques and methods are used in forensic anthropological identification, one of which is estimating body height.

Objective: This study is to find out the relationship of the length of the index and ring fingers with the height of the Batak students in the Department of Forensic and Medicolegal, Faculty of Medicine, Universitas Sumatera Utara for the period of March-October2023.

Methods: Methods: The subjects selected for this research were a sample of adults from the Batak tribe, which is currently the largest tribe in North Sumatra, consisting of 85 people (22 men, 63 women) aged between 21- 25 years, with measurement carried out using digital measuring instruments.

Results: Height, index and ring fingers length were significantly longer in males than females. The correlation coefficient (r) between height and the length of the index and ring fingers appears positive and statistically significant. In men, estimated height is more accurate if estimated based on the length of the right index, right ring, left index, and left ring fingers at once. In women, estimated height is more accurate if estimated based on the length of the right index finger alone. There is no difference in the level of accuracy in estimating height from the length of the index and ring fingers based on gender.

Conclusion: This study concluded that the index and ring fingers have a correlation with height, and the index and ring fingers can be used to estimate height.

Keywords: identification, height, index finger, ring finger

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Introduction:

Identification of a person is always a concern especially in forensic cases such as mass disasters, mutilated, or body parts found in homicides, accidents, and natural disasters.[1] In these cases it is necessary to conduct a forensic investigation. The main purpose of forensic investigation is to verify identity through the remains of the victim, which are consisting of parts of an individual's body that have been reduced to ashes, damaged, or dismembered.[2] Investigations into these damaged remains are conducted to develop biological profile that identifies the individual by estimating the age, sex, and stature of the remains. This profile helps increase the likelihood of identifying event or disaster information of the victim.[3]

Identification of these bodies can be done by forensic anthropology examination. Forensic anthropology, also part of anthropology, is concerned with the study of the biological and physiological characteristics of humans and their development.[4] Forensic anthropology is based on osteology and human anatomy with the aim of identifying individuals for legal and judicial purposes.[5]

Several techniques and methods are used in forensic anthropological identification, one of which is by estimating height. Height estimation through human remains is based on the principle that there is a linear relationship between height and various parts of the human body and bones. Previous studies estimating height through various body parts have proven to be able to construct estimation models with reasonable accuracy. Some previous studies such as Habib and Kamal estimated height based on the length of the hand and the length of the knuckles respectively. Jasuja and Singh estimated height using variable measurements of fingers and knuckles of North Indian adults.[6] Agrawal et al. designed a model that estimates stature using hand and phalanges length of North Indians.[7]

Indonesia has various ethnic groups, one of which is the Batak tribe which is the third largest population after the Javanese and Sundanese at 3.58%, with the main area being in North Sumatra Province. The Batak tribe consists of six sub-tribes such as Toba, Mandailing, Karo, Simalungun, Pakpak, and Angkola Sipirok. The Batak tribe is the largest tribe occupying North Sumatra by 44.75%.[8] Research related to the relationship between the length of the index finger and ring finger with height has not been widely conducted in Indonesia, especially in North Sumatra.

Based on the explanation above, the researcher is interested in conducting research related to the relationship between the length of the index finger and ring finger of the hand with the height of the Batak Tribe Doctor Professional Education Program students at the Department of Forensic Medicine and Medikolegal Sciences, Faculty of Medicine, University of North Sumatra for the period March-October 2023.

METHODS

This study was an analytic study with a cross-sectional design, in which sampling and data collection were carried out simultaneously at the same time so that no follow-up procedures were carried out.[9]

The study was conducted from March to October 2023 at the Haji Adam Malik Central General Hospital, Medan. This study has received ethical approval from the Ethics Committee for Health Research Implementation Number: 400/KEPK/USU/2023.

The population of this study were all Batak Professional Doctor Education Program (P3D) students at the Department of Forensic Medicine and Medikolegal Sciences, Faculty of Medicine, University of North Sumatra (FK USU) for the period March-October 2023 who met the inclusion and exclusion criteria. The inclusion criteria in this study were P3D students of the Department of Forensic Medicine and Medikolegal Medicine FK USU in 2023, Batak tribe, willing to become respondents and agree to informed consent. The exclusion criteria in this study are having / currently experiencing fractures, trauma, injuries to the bones of the index finger (digiti II manus) and ring finger (digiti IV manus) both right and left hands and the skeleton that makes up height, there are hand anomalies, inflammation, trauma, amputation, and deformities in the hand, there is a history of dislocation or fracture of the bones that affect height, and there are abnormalities in the constituents of height such as scoliosis, kyphosis, lordosis, gigantism, cretinism, and dwarfism.

The sampling technique in this study was total sampling, namely the entire population that met the inclusion criteria was included as a research sample.

Data collection used in this study was primary data in the form of a questionnaire for filling in identity, height measurement results, and the length of the right and left index and ring fingers. For height measurement using a calibrated microtoise measured from the highest point of the head (vertex) to the lowest point, namely the heel. For the measurement of the length of the right and left index and ring fingers using a digital sliding caliper. Measurements were taken by the same person 3 times and using the same side to avoid errors between individuals and measurements.

Data analysis in this study was univariate and bivariate analysis. Univariate analysis is useful for knowing and explaining the description of subject characteristics or data owned in the form of frequency and percentage for categorical variables, in the form of mean and standard deviation (if the data is normally distributed) or minimum and maximum values and median (if the data is not normally distributed) on numeric variables. Bivariate analysis was used to determine the relationship between the length of the index finger and ring finger of the hand with height. The data obtained in this study were numerical variables. Bivariate analysis was used to determine the relationship between the length of the index finger and ring finger of the hand with height. The data obtained in this study are numerical variables. The data is tested for normality first, if the data is normally distributed, the correlation test used is the Pearson test, but if the data is not normally distributed, the correlation test used is the Spearman correlation test. Furthermore, the data was analyzed using linear regression analysis to obtain a regression equation. The software used is SPSS version 26.

RESULTS

The number of respondents in this study were 85 samples with 22 men (25.88%) and 63 women (74.11%). The average length of the index finger of the right hand (JT1R) in men is 7.08 cm, while in women it is 6.78 cm. The average length of the index finger of the left hand (JT1L) in men was 7.10 cm, while in women it was 6.71 cm. The average length of the ring finger of the right hand (JM1R) in men is 7.26 cm, while in women it is 6.78 cm. The average length of the ring finger of the left hand (JM1L) in males is 7.30 cm, while in females it is 6.84 cm. The average height of males was 168.5 cm, while that of females was 156.3 cm. The normal distribution test (Kolmogorov-Smirnov) showed significant results (p>0.05) for height (p=0.087), JT1R (p=0.200), JT1L (p=0.200), JM1R (p=0.200), JM1L (p=0.200). Since the data were normally distributed, the Pearson correlation test was conducted.

Table 1. Pearson Correlation Test

Pearson Correlation Test			JT1R	JM1R	JT1L	JM1L
Male Height	Pearson Correlation		.671	.531	.699	.558
		Sig. (2-tailed)	.001	.011	.000	.007
	Pearson					
Female Height	Pearson Correlation		.603	.531	.587	.550
		Sig. (2-tailed)	.000	.000	.000	.000
	Pearson					

Interpretation of r value:

0.8-1=very good; 0.6-0.79=moderate; 0.4-0.59=weak; <0,4=very weak

JT1R = index finger of right hand; JM1R = ring finger of right hand;

JT1L = left hand ring finger; JM1L = left hand ring finger

Table 1 shows that the relationship between the length of the index finger of the left hand (JT1L) and height in men has the best correlation coefficient value, which is 0.699, while in women the best correlation coefficient value is the relationship between the length of the right index finger (JT1R) and height, which is 0.603.

Table 2. Pearson Correlation Test

Pearson Correlation Test		JT1R	JM1R	JT1L	JM1L
Male & Female	Pearson Correlation	.689	.682	.710	.665
Height	Sig. (2-tailed)Pearson	.000	.000	.000	.000

JT1R = index finger of right hand; JM1R = ring finger of right hand;

JT1L = left hand ring finger; JM1L = left hand ring finger

Table 2 shows the Pearson correlation results with a Sig value. (2-tailed) 0.000. Since the p value was <0.25, all variables were eligible for inclusion in the linear regression analysis.

From the results of the linear regression test on males and females, a linear regression equation was obtained to determine height based on the length of the index finger and ring finger of the right and left hands, as follows:

1. In the male sample

a. Height =108.464 + 8.430 (JT1R) ± 5.01

b. Height =104.969 + 8.826 (JM1R) ± 5.72

c. Body height = 99.187 + 9.630 (JT1L) ± 4.83

d. Body height =132.523 + 4.929 (JM1L) ± 5.60

e. Body height = 107.117 - 2.500 (JT1R) - 6.423 (JM1R) + 12.388 (JT1L) + 4.943 (JM1L) ± 4.62

Table 3. Male Liniar Regretion Test

Regresi Linier	Unstandardized Coefficients		Std. Error of the Estimate (SEE)
	B	Std. Error	
(Constant)	108.464	15.047	5.00510
JT1R	8.430	2.083	
(Constant)	104.969	22.958	5.72010
JM1R	8.826	3.150	
(Constant)	99.187	16.051	4.82724
JT1L	9.630	2.203	
(Constant)	132.523	12.252	5.60084
JM1L	4.929	1.639	
(Constant)	107.117	19.961	
JT1R	-2.500	5.785	
JM1R	-6.423	5.121	4.61779
JT1L	12.388	6.552	
JM1L	4.943	2.313	

JT1R = index finger of right hand; JM1R = ring finger of right hand;

JT1L = left hand ring finger; JM1L = left hand ring finger

2.In the female sample

a. Height =105.699 + 7.558 (JT1R) ± 4.84

b. Height =107.766 + 7.286 (JM1R) ± 5.14

c. Body height = 108.599 + 7.148 (JT1L) ± 4.91

d. Body height =112.023 + 6.620 (JM1L) ± 5.07

e. Body height = 102.544 + 4.072 (JT1R) - 0.764 (JM1R) + 2.274 (JT1L) + 2.448 (JM1L) ± 4.87

Table 4. Female Liniar Regretion Test

Regresi Linier	Unstandardized Coefficients		Std. Error of the Estimate (SEE)
	B	Std. Error	
(Constant)	105.699	8.627	4.83895
JT1R	7.558	1.279	
(Constant)	107.766	9.986	5.14154
JM1R	7.286	1.488	
(Constant)	108.599	8.484	4.91119
JT1L	7.148	1.261	
(Constant)	112.023	8.683	5.06815
JM1L	6.620	1.287	
(Constant)	102.544	9.692	
JT1R	4.072	2.908	
JM1R	-0.764	3.409	4.86756
JT1L	2.274	2.821	
JM1L	2.448	2.880	

JT1R = index finger of right hand; JM1R = ring finger of right hand;

JT1L = left hand ring finger; JM1L = left hand ring finger

DISCUSSION

Males had longer average index and ring finger lengths compared to females. It was also found that the male sample had a higher average height than the female sample. This was also revealed in research conducted at the Faculty of Medicine, Muhammadiyah University10, Syiah Kuala University Banda Aceh11, and Sam Ratulangi University Manado.[12]

Men tend to have a taller posture compared to women because men have longer limbs and in women have subcutaneous fat in the pelvic area and thighs, women also have a wider pelvis shape that gives the impression of being shorter.[10]

In this study, it was found that index finger length had the highest correlation coefficient with height than other hand measurements in both genders. Overall, index finger length was considered a better predictor of height than other finger lengths. Some previous studies have also shown that the length of the index finger is the most accurate measurement for estimating height.[10,13]

Internal factors (genetics, race, gender and age) and external factors (nutrition, minerals and vitamins, prenatal environment, drug use, diseases can affect height) cause population proportions may vary, resulting in linear regression equations for one population may not be used in another population so different linear regression equations must be found for each population to get the most accurate results.

CONCLUSSION

Based on the results of this study, the results were obtained:

- The average height was 168.52 cm.

- The average index finger length and ring finger length were significantly longer in males than females.

- The relationship between left index finger length (JT1L) and height (TB) in males had a better correlation than others (r = 0.699). The relationship between the length of the right index finger (JT1R) and height (TB) in females had a

better correlation than others (r = 0.603). Height by index finger and ring finger in males and females had moderate correlation and better correlation in males especially height by left index finger.

- In males, height estimation (TB) is more accurate if estimated based on the length of the right index finger, right ring finger, left index finger and left ring finger at the same time. In females, height estimation (TB) is more accurate if estimated based on the length of the right index finger only.

CONFLICT OF INTEREST

All authors stated there was no conflict of interest in the study. Data supporting the results of this study are available at the request of the relevant authors. Data is not publicly available due to privacy or ethical restrictions. Informed consent was obtained from all participants who participated in the study.

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REFERENCES

1. Rhiu I, Kim W. Estimation of stature from finger and phalange lengths in a Korean adolescent. J Physiol Anthropol. 2019.
2. Ahuja P, Manve P, Christal G, Dahiya MS. Estimation of Stature from Finger Length. Journal of Forensic Sciences. 2018 .
3. Kim W. A comparative study on the statistical modelling for the estimation of stature in Korean adults using hand measurements. Anthropol Anz. 2019;76(1):57–67.
4. B. Vasant Nayak, Ch. Laxmanrao, Nishat Ahmed Sheikh. Estimation of Stature from Length of Little Finger in the Population from South India. Indian J Forensic Med Pathol. 2019;12(2):113– 118.
5. Jayanth SH, Basappa S, Praveen S. Determination of Stature From Index and Ring Finger Lengths in South Indian Population. 2020.
6. Perugu Vanishri, Nishat Ahmed Sheikh. Anthropometric Measurements of Hand Length and Breadth for Estimation of Stature in South Indians. Indian J Forensic Med Pathol. 2019;12(2):124– 130.
7. Pal A, De S, Sengupta P, Maity P, Dhara PC. Estimation of stature from hand dimensions in Bengalee population, West Bengal, India. Egyptian Journal of Forensic Sciences. 2016; 6: 90–98.
8. Manja CD & Amaliyah S. Panoramic Imaging Support to Establish The Dimension and Shape of Condylary Process of Bataknese Students and Staffs In Faculty of Dentistry University of Sumatera Utara, Dentika Dental Jurnal, 2014.18(1):21-26.
9. Ghazali MV, Sastromihardjo S, Soedjarwo SR, Soelaryo T, Pramulyo HS. Studi cross-sectional In: Dasar-dasar Metodologi Penelitian Klinis, 5th ed. Sagung Seto, Jakarta. 2014.
10. Mubela Dewi K. Hubungan Panjang Jari Telunjuk Tangan (Digiti II Manus) Terhadap Tinggi Badan Pada Suku Batak Di Fakultas Kedokteran Universitas Muhammadiyah Sumatera Utara. Sriwijaya Journal of Medicine. 2020
11. Mirza R. Penentuan Tinggi Badan berdasarkan Panjang Jari Tengah pada Mahasiswa Fakultas Kedokteran Angkatan 2009 – 2012.ETD Unsyiah. 2013.
12. Sambeka C, Tanudjaja GN, Pasiak TF. Hubungan Tinggi Badan dengan Panjang Tangan Pada Mahasiswa Fakultas Kedokteran Unsrat Angkatan 2013. J eBiomedik(eBM). 2015;3(1):311–5.
13. Fatayati A. Korelasi antara tinggi badan dan panjang jari tangan. Dep Antropologi Fak Ilmu Sosial Dan Ilmu Politik Univ Airlangga. 2014;40–4