Original Article

THE RELATIONSHIP OF BODY HEIGHT WITH INDIGER FINGER VARIABLES IN ADULTS IN NORTH SUMATRA

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Background: The World Health Organization (WHO) states that a disaster is any event that causes damage, ecological disruption, loss of human life, worsening health status on a scale, or health services on a particular scale. Investigations of damaged corpses are conducted to develop biological profiles that identify individuals by estimating the age, sex, and stature of the corpse. Identification of these bodies can be done by forensic anthropological examination. Several techniques and methods are used in forensic anthropological identification, including estimating body height from human remains. In this study, researchers researched the relationship between the length of the index finger and body height.

Objective: This study aimed to determine the relationship between the length of the index finger and the height of adults in North Sumatera.

Metode: This research uses an analytical research design with a cross-sectional design conducted from November 2023 to December 2023 at H Adam Malik Hospital. Sampling was carried out by consecutive sampling of 80 people. Data was obtained from measuring body height and index finger length. The data is initially processed using a normality test. If the data is normally distributed, the Pearson correlation test is used; if the data distribution is not normal, the Spearman correlation test is used. After that, it is analyzed using linear regression analysis to obtain regression.

Hasil: The results were obtained from analyzing 80 respondents with an average age of 22.73 years for men and 22.54 years for women. The average height in the male group was 168.5 cm, and in the female group was 156.3 cm. The average length of the right index finger in the male group was 7.08 cm, and in the female group was 5.98 cm. The average length of the left index finger in the male group was 7.10 cm, and in the female group was 5.98 cm. In the normality test, the Sig score for height was obtained ($p=0.085$), Sig for the right index finger ($p=0.200$), and Sig for the left index finger ($p=0.200$) with the criterion of $p > 0.05$ which means the height, right index finger, and left index finger data are typically distributed. Pearson correlation results of right index finger ($p=0.001$, in men; $p=0.000$, in women) and left index finger ($p=0.000$, in men and women) with the criterion of $p<0.05$ which means there is a significant correlation between the length of index finger and body height

Kesimpulan: Likewise, this research showed a correlation between the length of the index finger and body height.

Keywords: Height, Index finger, Anthropology, Forensics

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Introduction:

The World Health Organization (WHO) states that a disaster is any event that causes damage, ecological disruption, loss of human life or worsening of health status on a scale or health services on a particular scale that requires a response from outside the affected community or region. Investigation of damaged corpses is carried out to develop biological profiles that identify individuals by estimating the age, gender and stature of the corpse to help increase the possibility of identifying victims and information about the event or disaster that befell the victim.[1] Identification of these bodies can be done by forensic anthropological examination. Forensic anthropology, also a part of anthropology, studies humans biological and physiological characteristics and their development. Factors such as eating habits (nutritional factors), ethnicity and race also play an essential role in the growth and development of an individual. Forensic anthropology is based on osteology and human anatomy, identifying individuals for legal and judicial purposes.[2] Several techniques and methods are used in forensic anthropological identification, including estimating body height. Estimating height through the human body remains based on the principle that there is a linear relationship between body height and various parts of the human body and bones. Previous studies that estimate body height using multiple body parts have proven capable of constructing estimation models with reasonable accuracy. Research conducted by Ahmed designed a model to estimate stature and gender using upper arm length, ulnar length, and wrist width about the upper extremity. Ozden et al. estimate height using foot and shoe size. Pelin et al. researched to estimate body height from head and facial dimensions.[3] Several previous studies, such as Habib and Kamal, estimated body height based on the length of the hand and the length of the knuckles, respectively. Jasuja and Singh estimated body height using variable measurements of the fingers and knuckles of North Indian adults. Agrawal et al. designed a model that estimates stature using the length of the hand and phalanges of North Indians.[4] Based on the explanation above, researchers are interested in researching the relationship between the length of the index finger and body height in North Sumatra adults aged 21 to 30 years. This research aims to determine the relationship between the length of the index finger and the height of adults in North Sumatra. The specific objectives of this research are (1) to determine the average height of adults in North Sumatra; (2) to determine the average length of the index finger of adults in North Sumatra; (3) to determine the relationship (correlation) between index finger length and adult height in North Sumatra; (4) Determine a formula that can be used to estimate body height from the length of the index finger of victims in North Sumatra.

Method

This research used quantitative research with a cross-sectional design. The sampling technique was using consecutive sampling. The total sample was calculated based on the total sample size for numerical- correlative analytical analysis, and the sample size was 80 people, namely all adults in North Sumatra. Respondents will be taken if they meet the inclusion and exclusion criteria. The inclusion criteria for this study were all adults from the people of North Sumatra aged 21 to 30 years who could stand upright, had no bone or other bodily defects, were willing to be respondents and had agreed to the informed consent form. Meanwhile, the exclusion criteria are people who have experienced or are currently experiencing a fracture, trauma or injury to the index finger bone (digit II manus) of either the right or left hand and the skeleton that makes up height; there are hand anomalies, inflammation, trauma, amputation and deformity of the hand; there is a history of dislocation or fracture of bones that affect height; abnormalities in height such as scoliosis, kyphosis, lordosis, gigantism, cretinism and dwarfism.

Data was collected directly from the research sample, which included measurements of body height and length of the index finger, which were taken three times and averaged. The independent variables of this study are the length of the right index finger and the length of the left index finger; the dependent variable is body height. In this study, data analysis used univariate and bivariate analysis. Data from this research will be processed using a statistical program application.
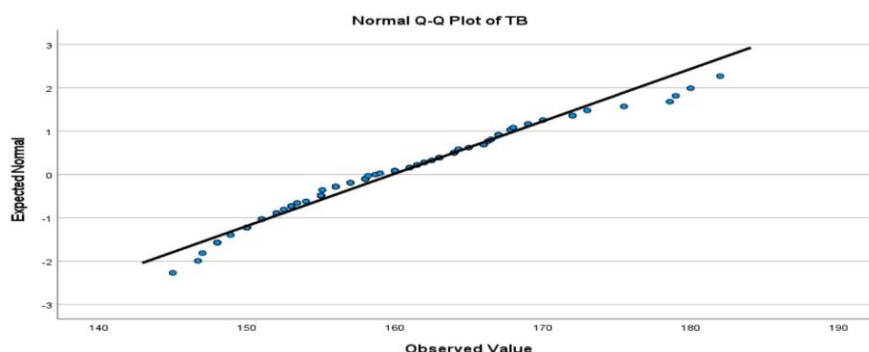
Result

The total number of respondents in this study was 85 respondents. The oldest in the male respondent group is 25 years, and the youngest in the male respondent group is 21 years. The average age in the male group was 22.73 years. The oldest in the female respondent group is 25 years old, and the youngest in the female respondent group is 21. The average age in the female group was 22.54 years. The highest height in the male respondent group was 182 cm, and the lowest in the male respondent group was 159 cm. The average height in the male group was 168.5 cm. The highest height in the female respondent group was 170 cm, and the lowest in the female respondent group was 145 cm. The average height in the female group was 156.3 cm. The most extended right index finger in the male respondent group was 7.67 cm, and the shortest right index finger in the male respondent group was 6.55 cm. The average length of the right index finger in the male group was 7.08 cm. The female respondent group's most extended right index finger was 7.69 cm. The shortest right index finger in the female respondent group was 5.98 cm. The female group's average length of the right index finger was 6.78 cm.

The longest left index finger length in the male respondent group was 7.60 cm, and the shortest was 6.54 cm, with an average length of 7.10 cm. In the female respondent group, the longest left index finger length was 7.69 cm, and the shortest was 5.98 cm, with an average length of 6.78 cm. The data is summarized in the following table.

N		Male	Female
Age	Oldest	25	25
	Youngest	21	21
	Mean	22,72727	22,53968
Height	Longest	182	170
	Shortest	159	145
	Mean	168.5222	156.3529
JTR	Longest	7,67	7,69
	Shortest	6,55	5,98
	Mean	7.08625	6.786956522
JTL	Longest	7,6	7,92
	Shortest	6,54	5,88
	Mean	7,1	6,841739

Because the research is correlative with a numerical measurement scale, analysis with Pearson correlation is used if the data meets the parametric test requirements. If it does not meet the parametric test requirements, then analysis with Spearman correlation is used. How to test the normal distribution of data for height, right index finger length, and left index finger length using the descriptive method (Q-Q PLOTS).

The output image of the TB variable data, with analysis using Q-Q Plots, shows that the TB variable is mostly patterned around the line; this indicates that the TB data is usually distributed.

The output image of the variable data for the right index finger (JTR), with analysis using QQ Plots, shows that the JTR variable is mostly patterned around the line; this indicates that the JTR data is usually distributed.

Normal Q-Q Plot of JTR

Normal Q-Q Plot of JTL
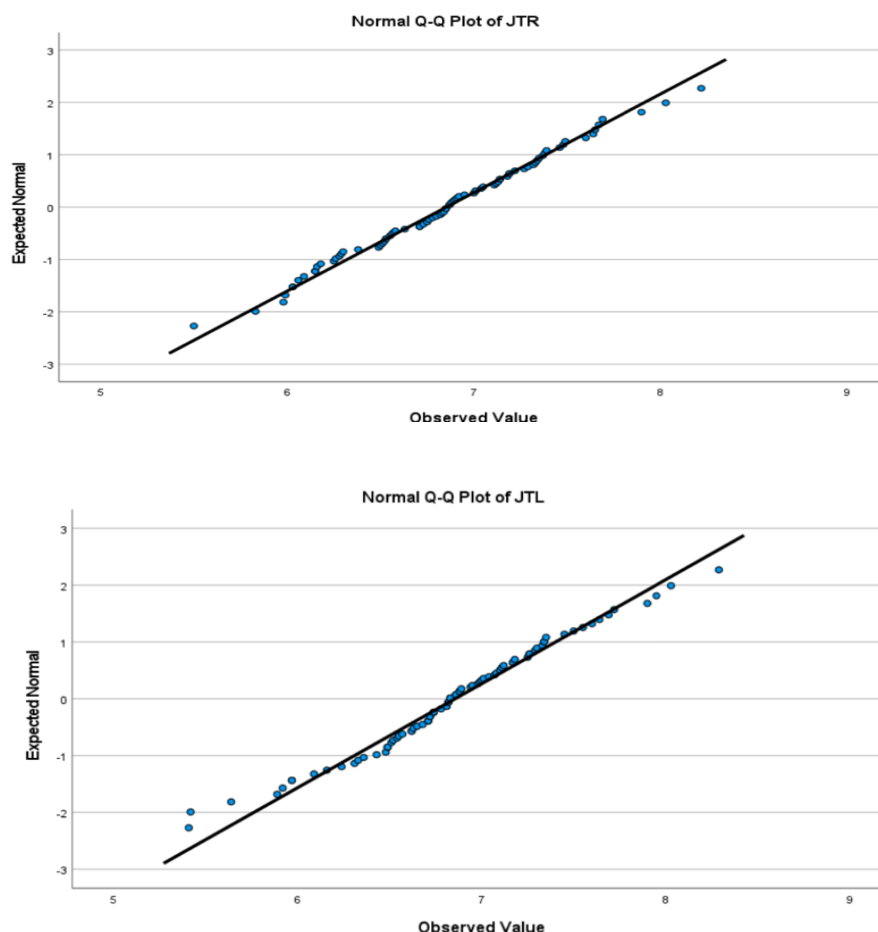
From the results of the test of Normality (regular distribution test), the output of the normality test for data on height (TB), right index finger (JTR) and left index finger (JTL) was obtained from Kolmogorov-Smirnov data (data > 50) respectively:

Sig TB = 0.085 (p > 0.05) Sig JTR = 0.200 (p > 0.05) Sig JTL = 0.200 (p > 0.05)

The criterion used in the standard distribution test is to accept H0 if the Sig value is greater than the predetermined alpha level. Since each Sig value is more significant than 0.05 (p > 0.05), H0 is accepted, which means that the TB, JTR, and JTL data come from a normally distributed population. Because the data were normally distributed, the analysis continued with the Pearson correlation test.

In this study, the Pearson correlation results showed a significant correlation between the length of the right index finger and height in men, with a P value of 0.001 (P<0.05) and a correlation value r of 0.671. The left index finger also showed a significant correlation with height in men, with a P value of 0.000 (P<0.05) and a correlation value of r of 0.699 (Table 1).

Table 1. Correlation of finger length and body height in men

No	Variable	Sig.(2-tailed)	Correlation (r)
1	JTRM	0,001	0,671
2	JTLM	0,000	0,699

Description: JTRM: Male Right Index Finger; JTLM: Male Left Index Finger.

In this study, the Pearson correlation results showed a significant correlation between the length of the right index finger and height in women, with a P value of 0.000 (P<0.05) and a correlation value of r of 0.603. The left index finger also showed a significant correlation with height in women, with a P value of 0.000 (P<0.05) and a correlation value of

r of 0.587 (Table 2).

Table 2. Correlation of finger length and body height in women

No	Variable	Sig.(2-tailed)	Correlation (r)
1	JTRW	0,000	0,603
2	JTRLW	0,000	0,587

In this study, the Pearson correlation results showed a significant correlation between the length of the right index finger and height in males and females, with a P value of 0.001 (P<0.05) and a correlation value r of 0.688 (Table 3). The length of the left index finger also showed a significant correlation with height in males and females, with a P value of 0.001 (P<0.05) and a correlation value of r of 0.710. Based on these results, the correlation of the length of the left index finger is higher than that of the right index finger in both males and females.

Table 3. Correlation of finger length and body height for men and women

No	Variable	Sig.(2-tailed)	Correlation (r)
1	JTR	0,000	0,688
2	JTL	0,000	0,710

Discussion

• Correlation between the length of the index finger in men with height

In this study, the Pearson correlation results showed a significant correlation between the length of the right index finger and height in men, with a P value of 0.001 (P<0.05) and a correlation value of r of 0.671. The length of the left index finger also showed a significant correlation with height in men, with a P value of 0.001 (P<0.05) and a correlation value of r of 0.699 (Table 4). The results of this study are in line with a previous study by Hasan et al. on 100 male medical students in Bangladesh (aged 20-25 years), who found a significant correlation between the length of the right index finger and height in men (p<0.01) with a correlation value r of 0.561, as well as a significant correlation between the length of the left index finger and height in men (p<0.01) with a correlation value r of 0.579.[5]

Table 4. Correlation of index finger length with height in males

No	Variable	Sig.(2-tailed)	Correlation (r)
1	JTRM	0,001	0,671
2	JTLM	0,000	0,699

Description: JTRM: Male Right Index Finger; JTLM: Male Left Index Finger.

The results of this study are also in line with research conducted in 2022 by K. Srinivasulu et al. on 75 men and 75 women (aged 18-25 years) in Hyderabad, India. They found a significant correlation between right index finger length and height in males (p<0.001) and a significant correlation between left index finger length and height in males (p<0.001).[6] This study is also consistent with the findings of Mulla et al., 2014, who studied 100 males and 100 females (aged 18-25 years) in Maharashtra, India. They found a significant correlation between right index finger length and height in males (p = 0.001; r = 0.602) and a significant correlation between left index finger length and height in males (p = 0.001; r = 0.741).[7] Another study of 89 males and 83 females in Korea was also conducted to determine which part of the index finger had the highest correlation coefficient with height. The results showed that the correlation coefficients of men's three highest phalanges were the middle, proximal, and distal segments (r = 0.52, 0.50, 0.44).[8]

• Correlation between index finger length in women with height

In this study, the Pearson correlation results showed a significant correlation between the length of the right index finger and height in women, with a P value of 0.000 (P<0.05) and a correlation value of r of 0.603. The length of the left index finger also showed a significant correlation with height in women, with a P value of 0.000 (P<0.05) and a

correlation value r of 0.587 (Table 5). The results of this study are in line with a survey conducted in 2022 by K. Srinivasulu et al. on 75 men and 75 women (aged 18-25 years) in Hyderabad, India, which found a significant correlation between the length of the right index finger and height in women (p<0.001) and a significant correlation between the length of the left index finger and height in women (p<0.001). This study is also consistent with the findings of Mulla et al., 2014, who studied 100 men and 100 women (aged 18-25 years) in Maharashtra, India. They found a significant correlation between right index finger length and height in females (p = 0.001; r = 0.649) and a significant correlation between left index finger length and height in females (p = 0.001; r = 0.724). Another study conducted on 89 men and 83 women in Korea aimed to determine which part of the index finger had the highest correlation coefficient with height. The results showed that in women, the highest correlation coefficients were found in the distal, proximal, and middle segments (r = 0.36, 0.33, 0.29).[6]

Table 5. Correlation of index finger length with height in females

No	Variable	Sig.(2-tailed)	Correlation (r)
1	JTRW	0,000	0,603
2	JTRLW	0,000	0,587

Description: JTRW: Female Right Index Finger; JTLW: Female Left Index Finger

• Correlation between index finger length in men and women with height

In this study, the Pearson correlation results showed a significant correlation between the length of the right index finger and height in men and women, with a P value of 0.000 (P<0.05) and a correlation value of r of 0.688 (Table 6). The length of the left index finger also showed a significant correlation with height in males and females, with a P value of 0.000 (P<0.05) and a correlation value of r of 0.710. Based on these results, the correlation of the length of the left index finger is higher than the right index finger in men and women.

This study's results align with research conducted in 2022 by K. Srinivasulu et al. on 75 men and 75 women (aged 18-25 years) in Hyderabad, India. They found a significant correlation between the length of the right index finger and height in men and women (p<0.001), as well as a significant correlation between the length of the left index finger and height in men and women (p<0.001).

Table 6. Correlation of index finger length with height in males and females

No	Variable	Sig.(2-tailed)	Correlation (r)
1	JTR	0,000	0,688
2	JTL	0,000	0,710

Description: JTR: Right Index Finger; JTL: Left Index Finger.

Conclusion

Based on a study of 80 adults in North Sumatra, the average age of men was 22.73 years, and the average age of women was 22.54 years. The average height in the male group was 168.5 cm, while in the female group, it was 156.3 cm. The average length of the right index finger in the male group was 7.08 cm, while in the female group, it was 5.98 cm. The average length of the left index finger in the male group was 7.10 cm, while in the female group, it was 5.98 cm. The normality test showed that the Sig value for height (TB) was 0.085, for the right index finger (JTR) was 0.200, and for the left index finger (JTL) was 0.200, with p> 0.05 criteria indicating that the data of TB, JTR, and JTL were usually distributed. The Pearson correlation results show that the length of the right index finger (JTR) has a p-value of 0.001 in men and 0.000 in women, and the size of the left index finger (JTL) has a p-value of 0.000 in men and women. A criterion of p < 0.05 indicates a significant correlation between the length of the index finger and height.

Ethical Approval

This study followed the procedures and code of ethics of the Health Research Ethics Committee of the University of

North Sumatera. The committee approved the Ethical Clearance Certificate with No 451/KEPK/USU/2024.

Conflict of Interest

The authors declare no conflicts of interest related to this research.

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