



## FINGER LENGTHS AS FORENSIC INDICATORS: CORRELATION WITH STATURE AND GENDER DETERMINATION IN DISMEMBERED BODIES

**Dr Manjunath**

Assistant Professor, Department of Forensic Medicine, Gouri Devi institute of Medical Sciences and Hospital, Rajbandh, West Bengal, India

### ABSTRACT

This cross-sectional study aimed to assess the correlation between finger lengths and stature for gender determination in forensic medicine. Measurements of non-dominant index and ring fingers were taken in 100 students aged 18 to 25 years. Significant differences were found in finger lengths and height between sexes ( $P < 0.0001$ ). Gender determination accuracy ranged from 71% to 92%, emphasizing the potential forensic relevance of finger measurements in identifying dismembered bodies. The study highlights the value of finger lengths as an additional tool for forensic investigations.

**Key words:** Forensic medicine, Anthropometry, Gender determination, Finger lengths, Stature correlation.

### INTRODUCTION

Forensic medicine's primary goal is individual identification, with factors such as nutrition, environment, gender, and genetics influencing stature as crucial identification parameters [1]. Notably, males generally exhibit greater height, linked to genetic factors, including the Y chromosome's impact on bone epiphysis fusion timing [2,3]. While measuring stature using long bones is a well-established and reliable method, challenges arise when identifying dismembered bodies, necessitating alternative indicators like the head, hands, arms, and feet. Previous studies have established a significant correlation between finger length and stature [4-8]. However, limited research has explored the relationship between index and ring fingers and stature in the population. This study aims to fill this gap by investigating potential correlations between stature and these finger lengths.

### METHODOLOGY

In this comprehensive cross-sectional study, a cohort of 100 students (comprising 50 males and 50 females) within the age range of 18 to 25 years was meticulously examined. Rigorous inclusion criteria were

applied to ensure the reliability of the study, excluding individuals with a history of strenuous manual labor, engagement in vocational hand sports, anatomical musculoskeletal deformities [6], or chronic illnesses such as diabetes, thyroid disorders, and renal failure. Before participating, all subjects provided informed written consent following a clear and concise presentation of the study's objectives. The data collection process involved a thorough examination of various parameters, including the lengths of the index and ring fingers, along with demographic details such as gender, age, and stature. Stature measurements were obtained by assessing the vertical height from the vertex to the heel while the subjects were in a standing position [9]. The precision of the height measurements, recorded in centimeters, was ensured by utilizing a tape measure. For the assessment of finger lengths, the non-dominant hand was the focus, and measurements were taken from the proximal crease to the tips of the index and ring fingers. To guarantee utmost accuracy in determining finger length, a millimeter-accurate caliper was employed in the measurement process [10-14]. This methodological approach aimed to establish

Corresponding Author: - **Dr Manjunath**

a robust foundation for the subsequent analyses and correlations explored in the study.

**RESULTS**

Upon scrutinizing the gathered data, it was determined that the average age of the study participants was 20.90±1.79 years, with no statistically significant difference observed between the mean ages of males and females (P>0.05). The height analysis, detailed in Table 1, revealed a noteworthy disparity. The Mean ± SD height was 170.88±9.70 cm for the entire sample, exhibiting a significant divergence between males (180.04±6.77 cm) and females (163.78±5.31 cm) (P<0.0001). The examination of finger lengths unveiled distinctive patterns. The Mean±SD lengths of the index and ring fingers were 69.47±5.19 mm and 69.96±5.41 mm, respectively, for the

entire cohort. A gender-based differentiation was evident, with males exhibiting longer index (74.16±4.79 mm) and ring (74.77±4.71 mm) fingers compared to females (68.81±4.11 mm and 69.02±4.65 mm, respectively). These differences in finger lengths between genders were statistically significant (P<0.0001). The cumulative measurement of the index and ring fingers, represented by the Mean±SD sum, further underscored gender-related distinctions. Males exhibited a sum of 147.84±8.89 mm, while females recorded 134.89±7.99 mm, signifying a substantial difference between the two groups (P<0.0001). These comprehensive findings provided a detailed characterization of the age, height, and finger lengths among the study participants, emphasizing the gender-specific variations in these anthropometric measures.

**Table 1: Descriptive statistics.**

Gender	Parameter	Mean±SD	Min.	Max.	95% Confidence Interval		P
					Lower Bound	Upper Bound	
	Age	20.47±1.89	19	26	22.08	21.96	0.057
	Height*	178.04±6.86	158	195	176.73	179.44	<0.0001***
Male	Index finger length**	71.09±4.79	59	90	73.21	73.97	<0.0001***
	Ring finger length**	72.86±4.65	61	89	71.74	73.59	<0.0001***
	Index+ring fingers length**	145.79±8.89	125	181	146.07	147.61	<0.0001***
	Age	21.97±1.65	21	26	21.76	21.41	0.058
	Height *	165.03±5.30	153	179	163.03	164-08	<0.0001***
Female	Index finger length**	68.79±4.04	59	79	65.97	67.57	<0.0001***
	Ring finger length**	69.19±4.64	58	80	68.30	68.98	<0.0001***
	Index+ring fingers length**	134.97±8.21	118	157	134.32	136.57	<0.0001***
	Age	22.03±1.78	19	24	22.56	22.07	0.057
	Height*	170.49±9.69	152	197	170.19	172.90	<0.0001***
Total	Index finger length **	70.37±5.17	57	87	68.76	72.21	<0.0001***
	Ring finger length**	70.91±5.41	58	91	71	72.04	<0.0001***
	Index+ring fingers length**	141.39±10.13	116	180	139.89	143.79	<0.0001***

The accuracy of determining gender based on the lengths of the index finger, ring finger, and the sum of the index and ring fingers was evaluated, yielding percentages of 93%, 72%, 74%, and 75.6%, respectively (refer to Table 2 for details). To delve into the relationship between height and finger lengths, correlation coefficients were calculated.

In the overall sample, a correlation coefficient of 0.67 was observed between a person's height and index finger length. For male and female samples, the correlation coefficients were 0.54 and 0.42, respectively. The comparison extended to the correlation between height and ring finger length, revealing coefficients of 0.70, 0.57, and

0.53 in the overall, male, and female samples, respectively. Examining the correlation between height and the sum of the index and ring fingers, the coefficients were 0.67, 0.70, and 0.72, respectively, in the overall, male, and female

samples. These correlation coefficients provide insights into the associations between height and finger lengths, further contributing to the understanding of anthropometric relationships in the context of gender determination.

**Table 2: A high degree of accuracy is needed when demarking points based on height, index finger length, and ring finger length**

Gender determination parameter	D. Point***	Sensitivity (%)	Specificity (%)	PPV (%)****	NPV (%)*****	Accuracy(%)
Height*	170	96	90	91	95	93
Index finger length**	71	75	69	71	73	72
Ring finger length**	72	76	72	74	75	74
Index+ring finger length**	142	77	74	75	76	76

**Table 3: Index finger and ring finger lengths are correlated with stature in males, females, and the total population**

Gender	Parameter	Person's Correlation Coefficient (r)	SEE (cm)	P*
Male	Index finger length	0.49	5.87	<0.0001
	Ring finger length	0.51	5.69	<0.0001
Female	Index finger length	0.42	4.82	<0.0001
	Ring finger length	0.54	4.52	<0.0001
	Index finger length	0.67	7.26	<0.0001
Total	Ring finger length	0.70	7.03	<0.0001
	Index+ring finger length	0.72	6.79	<0.0001

**DISCUSSION**

Within the studied population, we conducted an examination to elucidate the correlation among stature, index and ring finger lengths, and the relationship between stature and gender. The average height observed was 173 cm for the entire sample, with males averaging 178.07 cm and females 165.06 cm, a statistically significant difference ( $P < 0.05$ ). Significant distinctions were also found in the average lengths of index and ring fingers between males and females ( $P < 0.05$ ). Importantly, a substantial correlation of 0.72 was identified between the lengths of the index and ring fingers. It is noteworthy that these correlations were determined independently of considerations related to gender or height. This information contributes to a comprehensive understanding of

anthropometric relationships within this specific population.

**CONCLUSION**

The accuracy of determining gender through anthropometric criteria can vary, and the precision of these criteria may differ among different racial groups. A racial anthropological investigation aims to elucidate the variations in accuracy across races for these criteria. In our study, we assessed the efficacy of height, index finger length, and ring finger length in predicting gender. The measurements of height (92%) and index finger length (71%) exhibited the highest and lowest accuracy levels, respectively, in predicting gender.

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