ESTIMATION OF HEIGHT BY MEASURING INDEX FINGER LENGTH IN FEMALES

MUHAMMAD ASIF[1], PERVAIZ ZARIF[2], ZUBIA IQBAL[3]
[1]Sialkot Medical College, Sialkot, [2,3]Department of Forensic Medicine & Toxicology, PGMI, Lahore
Correspondence: drasif_hameed@hotmail.com

ABSTRACT
Introduction: Identification from fragmented body parts and mutilated body has become a routine for a forensic specialist because of increased occurrences of man or nature caused disasters. Standing height is one of the tools to help in identification. Height has been estimated from different body organs. In this study index finger length has been used to estimate height.
Objective: To find out correlation between height and index finger length and to formulate regression equation.
Material and Methods: It was a correlational study.102 females were selected through nonprobability method from general population according to selection criteria.
Collection of Data: Height was measured from vertex to ground level standing against the wall. Index finger length of both hands was measured with vernier caliper. Data was analyzed by using SPSS 21.
Results: Value of r between height and RIFL was 0.533. Value of r between height and LIFL was 0.456. This is statistically significant and positive.
Conclusion: Index finger length can be used to estimate height.

INTRODUCTION
Ascertaining the distinctiveness to sort out one individual from others is a basic job of forensic specialist. Measurement of body standing height is one of the tools which shorten the possibilities of probable persons. Thus helping towards definitive distinctiveness. Height can be estimated by finding out correlation between different body organs and standing height. By various dimensions of foot, hand, fingers etc., indirect height measurement can be done when complete dead body is not available. It can also be applied when only fragment of body is available.[1] Relationship between different organs measurements and ratios has been utilized to reach a succeful solution of individualization since centuries.[2]

In a study it was found that value of correlation coeffient between IFL and height was more positively and significantly correlated than that between ring finger length and height.[3] Length of finger on right hand is slightly more than that on left hand index finger .Similarly lengths of index finger of different races are different.[4] In another study a positive statistically significant correlation was found between index finger length and height. Estimation of height by IFL was more accurate than that by ring finger length in females than males.[5] Until this time literature review shows no study on this topic in Pakistan. But we need such studies because we come across terrorist bomb blasts a lot.

OBJECTIVES
To find out correlation between height and index finger length of both hands in females.

MATERIAL AND METHODS
Study Design: Correlational study.
Sample Size: 62 was minimum sample size according to formula. It was increased to 102.
Sampling Technique: Females were selected through nonprobability sampling (convenience sampling) method from general population.
Samples Selection: Inclusion criteria: Females of age 18 and above. Exclusion criteria: Females with a lower limb or vertebral column known deformities. Females with amputated and deformed index finger.
Data Collection: From general people samples were selected by convenience sampling. Only females as per the selection criteria were asked to take part in this study. After taking informed consent and age verification height from top of the head to the floor was taken by stadiometer .Stadiometer was fastened on wall 2000 mm above the ground level. To avoid diurnal variation all heights and IFL were measured by my LHV between 10 to 3 pm. Height was taken without

shoes, socks and any cloth on head. Nails were cut where required to measure the index finger length. IFL was measured from middle of the proximal crease to the middle of the tip of the finger by vernier caliper. Both hands index finger length was measured. Data was statistically analyzed by using SPSS version 21.

RESULTS

Table No 1 shows values of r with p values between height and RIFL and LIFL.

Table No 1

	RIFL	LIFL	P value
Height	0.533		< 0.001
Height		0.454	< 0.001

Table No 2 shows the values of r, r^2 and SEE.

Table No 2. Values of r,$r^2$and SEE when independent variable is RIFL.

Model	R	R Square	Std. Error of the Estimate
1	.533[a]	.284	7.15601
a. Predictors: (Constant), RIFL			
b. Dependent Variable: HEIGHT			

Values of regression coefficients with T and p value are depicted in table no 3.

Table No 3. Coefficients of regression when independent variable is RIFL.

Coefficients[a]				
Model	Unstandardized Coefficients	Standardized Coefficients	T	Sig.
	B	Std. Error	Beta	
1 (Constant)	89.095	10.553		8.443 .000
1 RIFL	9.867	1.566	.533	6.303 .000
Dependent Variable: HEIGHT				

Table No 4 shows the values of r, r^2 and SEE.

Table No 4. Values of r,$r^2$and SEE when independent variable is LIFL.

Model Summary[b]			
Model	R	R Square	Std. Error of the Estimate
1	.454[a]	.206	7.53680
a. Predictors: (Constant), LIFL			
b. Dependent Variable: HEIGHT			

Values of regression coefficients with T and p value are depicted in table no 5.

Table No 5. Coefficients of regression when independent variable is LIFL.

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	98.330	11.236		8.751	.000
	LIFL	8.556	1.679	.454	5.095	.000
a. Dependent Variable: HEIGHT						

Value of F with T and p value are depicted in table no 6.

Table No 6. Value of F when independent variable is RIFL.

ANOVA[a]						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	2034.239	1	2034.239	39.725	.000[b]
	Residual	5120.851	100	51.209		
	Total	7155.090	101			
a. Dependent Variable: HEIGHT						
b. Predictors: (Constant), RIFL						

Value of F with T and p value are depicted in table no 7.

Table No 7. Value of F when independent variable is LIFL.

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1474.754	1	1474.754	25.962	.000[b]
	Residual	5680.336	100	56.803		
	Total	7155.090	101			
a. Dependent Variable: HEIGHT						
b. Predictors: (Constant), LIFL						

Regression line between height and LIFL is shown in figure no 1.

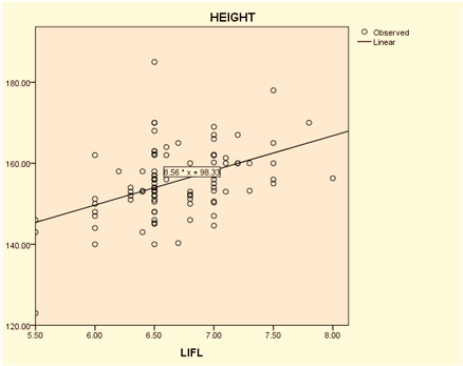

Figure No 1. Regression line between LIFL and height
Regression line between height and RIFL is shown in figure no 2.

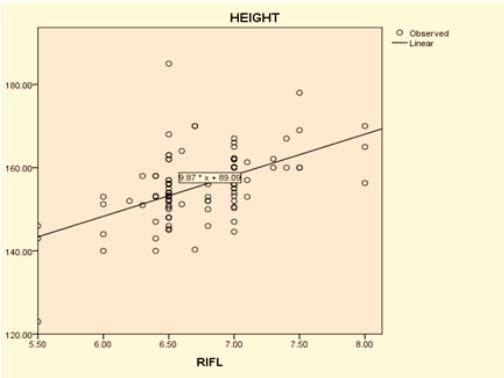

Figure No 2. Regression line between RIFL and height
Regression equation for LIFL and Height
Height = 8.56 x LIFL + 98.33
Regression equation for RIFL and Height
Height = 9.87 x RIFL+ 89.09

DISCUSSION

As it is evident from above mentioned results that height and index finger length are positively correlated. Value of r between height and RIFL is 0.533 with p value less than 0.05. This means that correlation is significant. Similarly value of r between height and LIFL is 0.456 with p value less than 0.05. It is also significant and positive correlation. The value of $r^2$for RIFL and height was 0.284 and 0.206 for LIFL and height. It means 28.4 % and 20.6 % of variance can be explained by RIFL and LIFL respectively. SEE for RIFL and LIFL was 7.16 cm and 7.54 cm respectively. SEE tells us about distance between predicted and observed values. T value tells us about significance of each coefficient individually. T value is not equal to zero of any coefficient, it means all coefficients are statistically significant (p value less than 0.05) indicating that there is correlation between variables. Value of F was 39.72 & 25.96 for RIFL &LIFL respectively. This is not equal to zero with a p value < 0.05. F value tells us about significance of overall model. It means model is statistically significant.[6] In a previous study in India value of r was found to be 0.54 between RIFL and height and value of r^2 was 0.29.[7] In another study carried out in Gujarat India value of r between height and RIFL and LIFL was 0.573 and 0.662 respectively.[8]

CONCLUSION

This study shows that index finger length of both hands is statistically significantly correlated with body standing height. It means by applying regression equation we can estimate height if we have index finger only.

REFERENCES

1. Pal, A., De, S., Sengupta, P., Maity, P. and Dhara, P. C. Estimation of stature from hand dimensions in Bengalee population, West Bengal, India. Egyptian Journal of Forensic Sciences. 2016; 6, 90-98.
2. Ilayperuma, I., Nanayakkara, G. and Palahepitiya, N. Prediction of personal stature based on the hand length. Galle Medical Journal. 2009; 14.
3. Krishan, K., Kanchan, T. and Asha, N. Estimation of stature from index and ring finger in a North Indian adolescent population. Journal of forensic and legal medicine. 2012 ;19, 280-290.
4. Mcfadden, D. & Bracht, M. S. Sex and race differences in the relative lengths of metacarpal and metatarsals in human skeletons. Early human development. 2009; 85, 117-124.
5. Sen, J., Kanchan, T., Ghosh, A., Mondal, N. and Krishan, K. Estimation of stature from lengths of index and ring fingers in a North-eastern Indian population. Journal of forensic and legal medicine. 2014 ; 22, 115.
6. Bitetti, R. Simple linear regression: a case study in r. [online] Available at <http://www.rpubs.com/bitettir/simpleregression.[Accessed 11 November 2018].
7. Raju, G., Shahina, S., Dubey, S. and Vijayanath, V. Estimation of stature from index and ring finger length in Davangere district. International Journal of Clinical Trials. 2014; 1, 18.
8. Gloria Christal, Prajakta Manve, Pooja Ahuja and MS Dahiya. Estimation of Stature from Finger Length. J Forensic Sci & Criminal Invest. . 2018; 7(2): 555709. DOI: 10.19080/JFSCI.2018.07.555709.