Original Research Article

Estimation of stature from length of middle finger among nepalese medical student of Nepal Medical College and Teaching Hospital

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Abstract

Background: Estimation of height from different body parts has received great attention in anthropology and forensic sciences. Moreover, determination of stature is an important parameter of personal identification of an individual. The present study was undertaken to evaluate the correlation between right middle finger length and stature of Nepalese population of Kathmandu in order to derive a formula for estimation of height for this population. **Methodology:** A total of 200 M.B.B.S students between 18-25 years of age were included in this study. Stature of each individual was measured using a stadiometer with head positioned in Frankfurt plane. The middle finger length was measured using a Vernier caliper from the proximal mid-point to the tip of right middle finger. A linear regression equation was derived for stature estimation from right middle finger length in both the sexes. Pearson coefficients were used to correlate the relationship between stature and MFL. **Result:** The mean stature of males was 170.02 cm and mean of middle finger length was 7.79 cm. Pearson correlation coefficient (0.422) obtained showed high significant correlation between right middle finger length and the height. The mean stature of females was 157.76 cm and mean of middle finger length was 7.43cm. Pearson correlation coefficient (0.442) obtained showed high significant correlation between middle finger length and the height. **Conclusion:** This study showed good correlation between middle finger length and stature among males and females. The obtained regression equations can be used for estimation of stature of this regional population.
Key Words: Identification, stature, Right middle finger length, Nepal.

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INTRODUCTION

The stature is one of the most important anatomical parameters for personal identification.[1] In forensic anthropology various parameters such as age, sex, ethnicity, stature etc. are used for personal identification. Among these, stature estimation is an essential parameter of medico-legal investigations, once a body is disfigured or dismembered.[2] Stature estimation is based ona principle that every body part has some constant relationship with height of an individual. Studies have been conducted in the past using body parts like hand and foot etc. for estimation of stature.[3,4-10] At present few data exists regarding estimation of height from finger length particularly in this part of the world. Hence, this study intends to fill this lacuna and aims to evaluate the utility of middle finger length in estimation of stature and to determine the precision of regression models derived from such parameter.

MATERIAL AND METHODS

This cross-sectional study was conducted in the department of forensic medicine, Nepal Medical College and Teaching Hospital, Jorpati, Kathmandu, Nepal after obtaining ethical clearance from the institutional ethical committee. The period of study was from November 2016 to May 2017. The total cross sectional sample consisted

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of 200 M.B.B.S students (Male= 100; Female= 100)between 18-25 years of age. The students were briefed about the purpose of study and written consent was obtained from each volunteer willing to participate in the study. The students were asked to stand straight barefooted with head position in Frankfurt plane and back of the head, shoulders, buttocks and heels touching the straight rod of the stadiometer. The head plate was dragged down in contact with the vertex to measure the height.[11]The same method was applied for all volunteers. Each measurement was repeated three times and a mean value was taken into consideration. The measurement was accurate to ± 0.5 cm. The students were asked to place their right hand on a table with palm facing upwards and fingers in extended flat position. Vernier caliper was used as a tool to measure the middle finger length i.e. from the proximal mid-point to the tip of right middle finger. The finger length measurement was also repeated three times similar to stature and average mean value was considered. Measurements were accurate to ± 0.1 mm. A linear regression equation was derived by using SPSS (Statistical Package for Social Science) version 21.0 for stature estimation from right middle finger length in male and females with stature acting as the dependent variable and finger length as independent variable. Then Pearson coefficients were used to correlate the relationship between stature and right MFL. Students having deformities in the hand like amputation of finger, congenitally malformed limbs, metabolic disorders and also developmental defects were excluded from the study along with non-consenting students

RESULTS

The mean stature of males was 170.02 cm with 6.40SD. The minimum and maximum stature was 152.5cm and 188cm respectively. In males, mean of the middle finger length was 7.79 cm with 0.54SD. By means of linear regression analysis a constant (131.29) and Pearson correlation coefficient (0.422) were obtained for the middle finger of males. The regression coefficient showed high significant ($p<0.001$) correlation between middle finger length and the height. The mean stature of females was 157.76 cm with 6.30SD. The minimum and maximum stature was 136.00 and 175.00cm respectively. Among females, mean of the middle finger length was 7.43 cm with 0.49SD. Applying linear regression a constant (115.65) and Pearson correlation coefficient (0.442) were obtained for the middle finger. The regression coefficient showed significant ($p<0.001$) correlation between middle finger length and height Table 1. A regression equation can be formulated using the values obtained by linear regression analysis and the stature can be estimated using that standard equation [12,13] which is: (S = Constant + Regression coefficient X MFL) where S = Stature, and MFL = Middle Finger Length. Thus the obtained equation for males is; (S = 131.29 + 0.422 X MFL) while for females it is; (S =115.65 + 0.442 X MFL) Table 2.

Table 1: Descriptive statistics of stature and right MFL among study groups

Sex	Variable	Minimum	Maximum	Mean	S.D	Constant	R	P value
Male(100)	Stature	152.5	188	170.02	6.40	131.29	0.422	< 0.001*
	Finger	6.40	9.30	7.79	0.54			
Female(100)	Stature	136.00	175.00	157.76	6.30	115.65	0.442	< 0.001*
	Finger	6.50	8.89	7.43	0.49			

SD = Standard Deviation, r = Correlation coefficient, *=Significant

Table 2: Linear Regression Equation for stature determination from right middle finger measurements of males and females

Gender	Side	Equation	S.E(cm)	R	R^2
Male	Right	H=131.29+0.422MFL	5.83	0.422	0.178
Female	Right	H=115.65+0.442MFL	5.68	0.442	0.196

Table 3: Regression equations for various regions

Authors	Region	Sex	Middle Finger	Regression Equation
Present Study	Kathmandu	Male	Right	S = 131.29 + 0.422 X MFL
		Female	Right	S =115.65 + 0.442 X MFL
Shivkumar AH[15]	Karnataka	Male	Right	S=152.02+1.47 X RMFL
Shivkumar AH[16]	Karnataka	Female	Both	S=90.54+6.9 X MFL
Rastogi P *et al*[5]	North Indians	Male	Right	S=117.20+6.82 X RMFL
		Female	Right	S=99.54+8.044 X RMFL
	South Indians	Male	Right	S=95.90+9.517 X RMFL
		Female	Right	S=110.93+6.52 X RMFL

DISCUSSION

In the present study strong correlation was observed between right middle finger length and stature in males and females. This is in accordance to findings of a study conducted by Rahule *et al*.[14] in Indian population where good correlation existed between right middle finger length and stature in males and females and higher correlation coefficient in females than males similar to our study. In our study the correlation coefficient was slightly higher (0.442) in females than males (0.422) suggestive of better correlation in females than males. Shivakumar AH *et al*[15] also found high statistical significant correlation between right middle finger length and stature among males of south Indian population of Karnataka region in India. Again, Shivkumar AH *et al*[16] in another study among females in the same south Indian population found significant correlation between right middle finger length and stature. However, the correlation coefficient and regression equation they obtained in their study was different from our study. (Table- 3).They opined after their study that right middle finger length can be used to estimate stature among males of that region.Similarly, Verghese AJ *et al*[17] in Mysore and surrounding regions of Karnataka, south India found significant correlation between middle finger length of both the hands and stature in males and females and recommended that those equations should be used for estimation of stature in their region of south India. Krishan K *et al* [6] after conducting a study in a north Indian adolescent population concluded that Index finger length and Ring finger length has statistically significant correlation with stature of adolescent population of north India and concluded that stature in a living person can be predicted with a reasonable accuracy from both the fingers. Also, Tyagi AK *et al* [18]also found significant relationship between finger length and stature and recommended the use of regression equation for stature estimation. Likewise, Shintaku and Furuya[19]in 1990 detected good association between middle finger length and stature among Japanese females, the range of correlation of proximal phalange and stature in that group ranged from 0.521 to 0.696. Equally, Rastogi P *et al*[5] noticed good correlation (Table- 3) between stature and middle finger length and significant differences in mean stature of both males and females in north and south Indian population. However, they did not observe any variations in male to male and female to female stature. They emphasized that same formula cannot be useful in both the sexes for estimation of stature. They also stated that persons of same race but different geographical regions have no much influence on body proportion and therefore need no different formulas for stature estimation. Srinivas PP *et al*[20] after comparing palm and stature in both males and females of same race but of different region i.e. north and south Indians showed non-significant differences in stature of both the sexes thereby indicating no variation of stature in both gender of same race despite having different geographical differences. There are no sufficient data in this context among Nepalese population to compare and debate about the variations however, an attempt has been made and a linear equation have been formed which can be a vital tool to estimate stature in the Nepalese population of Kathmandu region.

LIMITATIONS OF STUDY

The study was conducted in a particular age (18-25 years) group. It is obligatory to be conducted among all the age groups with extremes of age and larger sample size to observe any presence of variations.

CONCLUSION

Estimation of stature forms an important parameter to reach to the partial identification of an unidentified body and dismembered remains. The results of the present study indicate that the middle finger length can be efficiently used for estimation of stature. Most authors have underlined the need for population-specific stature estimation formulae. In this study we derived a separate regression equation to estimate stature from middle finger length for Kathmandu region of Nepal. The obtained regression equations S = 131.29 + 0.422 x MFLfor male and S =115.65 + 0.442 X MFLfor female can be used for estimation of stature of males and females of Kathmandu population even if only an amputated hand is found and other body parts are unavailable. The results of this study are however, applicable only when an intact middle finger is examined. Such studies can help in narrowing down the pool of possible victim matches in cases of identification from dismembered remains.

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