Indian Journal of Forensic Medicine and Pathology
Volume 3, Number 2, April - June 2010

Determination of Personal Height from the Length of Head in Maharashtra Region

Pawar Sudhir E.*
Zambare B.R.**
Shinde S.V.***
Reddy Bhaskar B.****

ABSTRACT

Aims & Objective: In this study an attempt is made to find out correlation and to derive a regression formula between head length (glabella to inion) and total body height in Maharashtra region. **Material & Method:** The study is conducted on 406 medical and paramedical students from Maharashtra region. The age was in range of 17 to 22 years. The length of head is measured between the two fixed points i. e. between Glabella and Inion. To measure this length the spreading Vernier caliper was used. These measurements were done between fixed times to avoid the diurnal variation. The results obtained were analyzed and attempt was made to derive the formula between head length and total height of an individual. **Result:** The result from this study showed definite correlation between head length and height of an individual, in spite of racial and ethnical variation. **Conclusion:** The data from present work will be definitely useful not only for anatomist but also for anthropologist and also in forensic medicine and sciences.

Key Words: Regression formula, head length, total height, anthropologist.

INTRODUCTION

In point of the Anthropologist, the "height "parameter remains always in the center for various studies. To assess the height of an individual remains always interesting for various authors. It is calculated by measuring different parts of body. In many studies the relations (formula) have been find out between height and different long bones of human body. It will help us to find out the height of an unknown individual when only the few long bones are available. This point is very important not only for the Anatomist but also for the Dept. of Forensic medicine, where the analysis of medico legal cases has been carried out routinely to help police department.

In most of the Govt. medical colleges, always a help is taken by the police department from the department of anatomy and if required from department of Forensic medicine, in case where they get the suspected material of body parts i.e. muddemal (bones and masses of human body) in there areas. They use to send such muddemal to anatomy department of nearest Govt. medical college to find out any foul play behind it i. e. medicoleagal cases (M.L.C.). They always want to know whether these bones belong to human

Author's Affiliations: *Associate Professor, **Professor, *** & ****Assistant professor, Dept. of Anatomy, P.D.V.V.P.F's Medical College, ViladGhat, - 414111Ahmednagar, (MS), .

Reprint Requests: Dr. Sudhir.E.Pawar, Associate Professor Dept. of Anatomy, P.D.V.V.P.F's Medical College & Hospital, Ahmednagar - 414 111, Maharashtra, Mobile No. 09890539804

E-mail address: drsudhiranatomy@yahoo.com

being or nor, the time since death, any possibility of poisoning, possible cause of death, possible sex of unknown individual, and the possible height of that individual. So this height parameter is important here to enable us to calculate it from any bone available. Because every time long bones will not be available

There are so many authors like Singh and Sohal[9] (1951), Singh and Shamen Singh[5](1956) charnalia[2] (1961) , Athawale [1](1963) , Patel et al (1964), Qamara et al[10](1979), Shroff and Vare [8](1979) have tried to find out formula for calculating the stature from long bones, but universally applicable formula has been not derived, as the relationship between long bones and height differs according to race, age, sex and side of body (Hardilka,1947)[4]. It is proved that each race required its own formula.

Estimation of height from length of head is also attracted by many authors like Saxena SK et al[7](1981) , but significant formula has been not derived. Also an attempt is made by Jadhav H R and Shah G.V.[11](2004) in Gujarati population to derive formula for their region.

Therefore an attempt is made to find out such formula to calculate height of an individual from the length of head in Maharashtrian population.

MATERIALS & METHODS

In the present study the parameters like "length of head" and "height" are considered. They were measured on 406 subjects (198 males and 208 females). The subjects were medical and paramedical students belonging to various regions of Maharashtra with having almost similar socio economic status. The age group of students ranges from 17 to 22 years. The measurements were taken at fixed time between 2 to 5 p.m. to eliminate the discrepancies due to diurnal variation. The head length was measured by spreading vernier caliper from glabella to inion (Hardlika[4]) and the height of individual is measured by height measuring instrument.

RESULTS

Four hundreds and six subjects comprised 198 males and 208 females were included for the study. They were age group ranges from 17 to 22 years. The value of measurement of "length of head" and "height" is depicted in the table-1. These Mean ,S.D. and S.E. are required to calculate the Correlation-Coefficient factors(r). All this is required statistically to derive regressive equation finally.

Table 1: Values of recorded observation

Parameters	Age(Years)	Head Length(cm)	Height(cm)
Range	17-22	15.3-20.4	140.5-190
Mean	18.70	17.92	163.29
S.D.	1.18	0.83	9.36
S.E.	0.05	0.04	0.46

The mean of height and length of head calculated as per Age of the cases. It is observed that maximum height in males belong to 18 years (171.98 cm) and female (159.35 cm) of aged 17 years while maximum length of head in males aged 22 years and in females aged 17 years (Table-II).

Table II: Age V/S height and head length

Age	Height mean (cm)		Head length mean(cm)	
	Male	Female	Male	Female
17	170.81	159.35	18.28	17.59
18	171.98	156.24	18.40	17.53
19	171.59	154.3	18.42	17.39
20	168.42	156.13	18.61	17.28
21	167.25	158.75	18.5	17.45
22	166	153.06	18.75	16.88

The table-III depicts the correlation-coefficient (r) values of various parameters. As data is available in this study we have made efforts to make correlation between possible parameters like age and height, age and head length, male and height, etc. Among the above correlations Height and Head length is most effective and significant statistically as value is more close to +1 (table-III).

Table III: Correlation–Coefficients (r)

Parameters	Coefficient value (r)
Mean Age and Height	-0.077
Mean Age and Head length	-0.015
Male and Height	-0.184
Female and height	-0.17
Sex and height	-0.175
Male and Head length	0.15
Female and Head length	-0.15
Sex and head length	0
Height and head length	+0.629

DISCUSSION

In the past many workers have done the work to assess the height from the length of different long bones. They have got successful correlation between the height and the length of head. But we came across very few references showing relations between height and length of skull. A study conducted by Saxena et al[7] (1981) in Agra population. There correlation coefficient between height and length of skull was +0.2048. But we did not get such references from Maharashtra region recently. So that, we have decided to carry out such work to derive formula for Maharashtrian population. The medical and paramedical students were selected as subjects for their easy availability.

Table no. I show that the age ranges from 17 to 22 years, head length from 15.3 cm to 20.4 cm and total height from 140.5 cm to 190 cm with a significant correlation between them.

The Table –II shows the correlation coefficients between various parameters. Between age and height, age and head length and between height and head length is positive suggesting that it is significant.

Various workers have shown significant correlation between height and different parts of body. Singh and Sohal[9] (1951), Jit and Singh[5] (1956) have shown a significant correlation between height and length of clavicle.

Charnalia[2] (1961) showed the significant correlation between height and foot length, where correlation was 0.46. Athwale[1] (1963), derived a regression equation between total height and forearm bones. In the findings of Patel et al (1964)[6] they have derived regression equation between tibia and total height in Gujarati population. Qamara et al[10](1979) conducted a study of height and foot length and derived a correlation coefficient for foot breadth (male 0.42 , female 0.47) and foot length (male 0.69 , 0.70), Shroff and Vare[8](1979) have also derived the height from the length of superior extremity and its segment.

But there are very few studies have conducted on relations between head length and height. We can come across two studies similar with this. One by Saxena et al[7] (1981) carried out in Agra population where they had derived correlation coefficient between height and head length was +0.2048. According to Glaister[3] (1957) nasion – inion length (head length) is 1/8 of the total height of an individual. The other study was carried out in Gujrat by Jadhav H.R. and Shah G.V.[11](2004), where correlation coefficient between height and head length was +0.53. From the present study data the formula is derived as under—

Regression Equation

For Male $Y = (58.15) + (6.11) X$

For Female $Y = (71.21) + (4.87) X$

For both Male and Female (Combined)

$$Y = (38.03) + 6.99 X$$

Where , Y = Total height

X = Head Length

So with the present study data the correlation - coefficient between the height and head length is + 0.62 , which is most significant.

SUMMARY & CONCLUSION

There are so many studies have conducted by workers to find out relation between height and different parts of body. Some of them have developed relation between height and foot length and derived formula to calculate height and some have worked to derive formula to assess the height from length of superior extremity. The relations between height and length of clavicle had also

developed. We have very few references indicating relations between length of skull and height hence we have carried out this work in Maharashtra region. In Medico-legal cases most of the times we will not get long bones to calculate the height of an unknown individual. To make the complete list of parameters we have made present study to derive formula to calculate height from length of head and a significant correlation coefficient between height and head length (glabella to inion) established. With this findings it is clear that by the measurement of either any (head length or total height) the other can be calculated and this fact may be of practically use in Medico legal cases (M.L.C.) investigations.

ACKNOWLEDGEMENT

We are very much thankful to our Deputy Director and Principal sir for giving permission to carry out this study in our college.(PDVVPF'S Medical College, Ahmednagar). Also we are thankful to our Statistian Mr. Lokhande for helping to calculate statistic analysis.

REFERENCES

1. Athwale MC: Anthropological study of height from length of forearm bones. A study of one hundred maharashtrian mal adults of ages between twenty five and thirty years. American Journal of Physical Anthropology. 1963; 21: 105-112.
2. Charnalia VM. Anthropological study of foot and its relationship to stature in different cases and tribes of Pondicherry state. Journal of Anatomical Society of India. 1961; 10: 26-30.
3. Glaister John. In medical jurisprudence and toxicology. 10th Edition E & S, Livingstone Ltd. Edinburg and London. 1957; 79.
4. Hardilaka A. Practical anthropometry, 4th edition, Philadelphia, (The wistar institute of anatomy and biology). 1952; 87-89.
5. Jit Iinder and Shamer Singh. Estimation of stature from clavicle. Indian Journal of Medical Research. 1956; 44: 137-155.
6. Joshi NB, Patel MP and Dongre AV. Regression equation of height from ulnar length. Indian Journal of Medical Research. 1964; 52:1088-1091.
7. Saxena S K, Jeyasingh P, Gupta AK and Gupta CD: The estimation of stature from head –length. Journal of Anatomical Society of India. 1981; 30: 78-79.
8. Shroff AG and Vare AM. Determination of height from length of superior extremity and its segments. Journal of Anatomical Society of India. 1979; 28: 53.
9. Singh B and sohal HS. Estimation of stature from clavicle in Punjabis; A preliminary report. Indian Journal of Medical Research. 1951; 40:67-71.
10. Suneel Qamara, Inderjit and Deodhar SD. A model for reconstruction of height from foot measurements in an adult population of northwest India. Indian Journal of Medical Research. 1980; 71: 77-83.
11. Jadhav H.R.,Shah G.V :Determination of personal height from the length of head in Gujarat region. Journal of Anatomical Society of India. 2004; 53(1): 20-21(2004).