Correlation and Regression Analysis of Stature In Relation To Head Length in Children

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Abstracts: Background & objective: Present study was carried out to find correlation and to derive a regression formula between head length and body height in Gujarat region. This is useful in anthropology, anatomy and forensic medicine. The material consists of 500 students from Gujarat. Methods: The age of subject was in the range of 8 to 18 years.The length of head was measured between two craniometric points, glabella and opisthocranion. Spreading caliper was used to measure head length. Height of the subject was measured with standard Height measuring instrument subject in anatomical position. Measurements were taken at fixed time to avoid diurnal variation. Results: The result obtained was analyzed and attempt was made to derive a formula between head length and total height of an individual. The result shows that there is a Moderate correlation between head length and height of an individual. Interpretation & conclusion: In present study the correlation co-efficient between height and head length is +0.30 Which is moderately significant and p value <0.05 and regression formula obtained is Y= 12.33 +7.75X. [Pandya P et al NJIRM 2012; 3(3) : 43-46]
Key words: Andhra Anthropometry, Correlation, Head length, Total height, Glebella, Opisthocranion

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Introduction: Anthropometry constitutes the means of giving quantitative expression to the variations which different individuals or traits exhibit. The estimation of height from various parameters has been done by many workers Singh and Sohal [11], Inderjit Singh & Shamer Singh[7], Athawale[2]. They have derived their own formulae for calculating stature from long bones. Universally applicable formulae have not been derived because the relationship between height and long bones or other measurements differ according to race, age, sex and side of the body. It is proved that each race, and age group require its own table.

Estimation of height from length of head has also attracted many workers to derive a formula, Saxena SK et al, (1981), but no significant formula has been derived to calculate the height from head length in Gujarat. Hence in the present study and attempt has been made to find out the correlation (if any) between head length and body height in Gujarati population, especially in Bhavnagar region.

In cross-sectional study of Harsh MP[5] 200 school children, aged between 8-12 years ,he evaluates the correlation of body height and head length   The regressions equation derived are:
For males: Y=8.975+7.258(X)
For females: Y=2.189+7.846(X)
For both male & female: Y=16.398+6.910(X)
Where,   Y= Total height,
        X= Head length.
If either of the measurement (head length or total height) is known, the other can be calculated. This fact will be of practical use in medico legal investigations and in anthropometry.

Material and Methods: The present study was conducted on 500 (370 male & 130 Female) medical students belonging to Bhavnagar regions of Gujarat. For that I had taken permission of ethical committee of IRB, govt.medical college, Bhavnagar. The corrected subjects have similar socio-economic status. The age group of the students ranged from 8 to 18 year. The measurements were taken at fixed time between 12 to 5 p.m. to eliminate the discrepancies due to diurnal variation. Head - length was measured by Caliper from glabella to opisthocranion and height of the individual was measured by Height measuring instrument.

After collected data, they were subjected to analyze statistically which had given me some important information regarding the following parameters.

Result: Table-1 Values of Recorded observations in Males & Females (500)

Sr. No.	Variable	Height (cm)	Head Length (cm)
1	Mean	143.91	16.96
2	S.D.	15.68	0.684
3	Standard error of estimation	0.7	0.03
4	Summation	1222474	144068.28
5	CV	10.89	4.03

Table-2 Regression analysis for Prediction of Height in all cases

Simple Linear Regression Formula	Males & Female (500)
Y=a + bX	Y= 12.33 +7.75X

Table-3 Pearson's Correlation Coefficient in Males & Females

Sr. No.	Independent Variable	Head length(cm)(X)
1	Correlation Coefficient (r)	0.38
2	Coefficient of Determination (r²)	0.145
3	Regression Coefficient (b)	7.75
4	Intercept (a)	12.33

Regression analysis for the prediction of total height in present study:

For Male: Y = 9.6+ 7.95Xwhere,
For Female: Y= 8.19 + 8.11X
For Combined: Y= 12.33 +7.75X

Y=Height, X=head length

Discussion: In the present study we have observed the correlation of height (in anatomical position) with head length amongst students of Bhavnagar.

Various workers have shown significant correlation between height and different parts of the body Saxena et al 1981[9] Derived a regression equation between head length and height in Agra population (UP). Their correlation coefficient between head length and height was +0.2048. This was cephalometric study on males aged between 25-30 years where head length measurements were taken from nasion to inion.

Singh and Sohal[11], Jit and Singh[7] have shown a significant correlation between height and length of clavicle Charnalia, showed the significant correlation between height and foot-length, where correlation coefficient was 0.46. Athawale (1963)2 derived a regression equation between total height and forearm bones. Patel, Joshi and Dongre (1964), have derived regression equation between tibia and total height in Gujarati population. Qamra et al (1979), made a study on height and foot length and derived a correlation coefficient for foot breadth (Male 0.42, Female .0.47) and foot length (Male 0.69, Female 0.70). Shroff and Vare (1979), have also derived the height from the length of superior extremity and its segments.

Trotter M et al[13] Have stated requirement of different regression equations among different races after studying different races for relationship between lengths of long bones and stature. It is important to note that every race of particular age group and sex should have its own table for estimation of height using various parameters. Lal C.S. and Lala J.K[15]Worked on a population of 258 of age ranging from 12 to 21 years in North Bihar for the estimation of height by Surface Anatomy of long bones e.g. Tibia & Ulna The ulnar mean multiplication factor was comparable in all cases.They have claimed that Ulnar Multiplication Factor is better guide for calculation of height when it is not definitely

known to which part of the country the individual belongs.

But no data is available in the literature regarding the estimation of stature from the head length, except Saxena et al (1981), who derived a regression equation between head-length and height in Agra population (U.P.). Their correlation

Coefficient between head -length and height was 0.2048. According to Glaister (1957), nasion-inion

Length (head-length) is 1/8 of the total height of an individual. To the best of my knowledge, this is the first time that nomograms have been successively developed for head length in Bhavnagar district & adjacent areas of Gujarat.
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Table-4   Comparison with similar previous study with Present study

Workers	Age	Height (Mean) (cm)	Head length (Mean) (cm)	Correlation Coefficient (r)
HARSH.M.P (2008)	8-12 yrs	134.55	17.26	r = 0.451
Present study (2011)	8-18 yrs	143.9	16.7	r= 0.38

Conclusion:
Classification of Correlation Coefficient (r):
   Up to 0.1- Trivial Correlation
   0.1-0.3   - Small Correlation
   0.3-0.5   - Moderate Correlation

In present study r=0.38, that suggest moderate correlation between head length and body height.
          t test   t=9.21

The Height is more if the head length is more. This holds true for the sample size taken.

't' test for regression coefficient was found to be statistically significant. It suggests that a significant contribution of head length towards height.

As already stated earlier, the correlation coefficient worked out by Harsh MP is +0.451.In study of Saxena et al (1981) correlation coefficient was 0.2048, while   in present study the correlation co-efficient between height and head length is +
0.30 Which is moderately significant.

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