

Estimation of Stature Using Different Facial Measurements Among the Kabui Naga of Imphal Valley, Manipur

Jibonkumar and Lilinchandra

*Department of Anthropology, Manipur University, Canchipur,
Imphal 795013, Manipur, India*

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ABSTRACT In the present study, an attempt has been made to investigate the co-relation between stature and different facial measurements among the Kabuis of Imphal valley, and estimate the stature using Regression equation and Multiplication factor. The study has also further tried to determine the more reliable approach. The sample size of the present study comprises of 199 male Kabuis of the Imphal Valley belonging to the age range of 18 to 45 years. Six facial dimensions of each subject along with their stature were measured. The highest co-relation has been found between stature and Bigonial Breadth with a 'r' value of 0.365.

INTRODUCTION

Forensic Anthropology has a varied array of means and method to identify the culprit as well as the victims in crime cases. In any investigative process, particularly in crimes resulting in fatality, the identification of the culprit starts from the detailed examination of the victim. Stature or body height is one of the most important and useful anthropometric parameter which determines the physical identity of an individual. Therefore, determination of stature from different body parts and skeleton remains has obvious importance in the identification of the criminals and victims. In cases where the evidences are skeleton remains, forensic anthropology has put forward means to estimate the stature from these skeleton and even fragmentary bones (Badukar et al., 1989, 1990).

Many studies have proved beyond doubt that there is positive co-relation between stature and length of long bones (Athwale, 1963; Patel et al., 1964; Joshi et al., 1964, 1965). In a similar approach, many workers have demonstrated positive co-relation between stature and other body dimensions (Duggel et al., 1986; Nath et al., 1988, 1990a, 1990b, 1997; Anand et al., 1990; Singh, 1991; Harashawaradhana, 1996; Kaur, 1999; Jain et al., 1999; Singh, 2000; Vani et al., 2000).

Though works concerning estimation of stature from long bones as well as from certain body dimensions have been put forward for some of the Indian populations, works concerning estimation of stature from facial dimensions are

scanty. As any part of the human skeleton can be found as the evidences, there is perhaps a need to investigate whether there is any possible significant co-relation between stature and facial dimension in human body.

Therefore, the present work attempts to estimate stature from facial measurements among the Kabui Tribe of Manipur.

MATERIAL AND METHODS

Data for the present study comprises of 199 male Kabuis of the Imphal valley in the age group of 18 to 45 years. Six facial dimensions of each subject along with their stature were measured following the conventional methods of Martin and Saller (1959) and Nath (1993).

1. *Height Vertex (HV)*: It measures the greatest distance from the plane where the subject stands to the vertex (v) on the head. It is measured by using anthropometer rod.
2. *Total Facial Height (TFH)*: It measures the straight distance from the nasion (n) to the gnathion (gn). It is measured by using sliding caliper.
3. *Physiognomic Facial Height (PFH)*: It measures the straight distance between trichion (tr) and gnathion (gn). It is measured by using sliding caliper.
4. *External Bi-Ocular Breadth (EBB)*: It measures the straight distance between ecto-canthion (ec) i.e., outer corners of the eye. It is measured by using sliding caliper.
5. *Inter-Ocular Breadth (IB)*: It measures the straight distance between endo-canthion (en)

- of the eye, with the eye-lids open. It is measured with the help of sliding caliper.
6. *Breadth of Bizygomatic Arch (BBA)*: It measures the straight distance between the two zygia (zy). It is measured by using spreading caliper.
 7. *Bi-Gonial Breadth (BGB)*: It measures the straight distance between the two gonion (go). It is measured with the help of spreading caliper.

Data were subjected to statistical analysis for determining Mean, Standard Deviation, Pearson's 'r'-value, Multiplication factor and Linear Regression Equation by using 'Stat Calc'- a statistical computer software.

RESULTS AND DISCUSSION

Table 1 displays the mean values with their respective standard deviation of the seven different facial parameters of the Kabuis. It is seen that the average height of the Kabui Naga males fall under the range 150.2 cm to 175.0 cm. While the maximum frequency is observed in the range 160.0 cm -164.9 cm having frequency of 36.7%, the minimum is observed in the class 175.0 cm -179.9 cm with a frequency of 0.5%.

Table 1: Mean and S.D. for six facial measurements and stature of male Kabuis of Imphal valley (N=199)

Parameters	Ranges (in cm.)	Mean (in cm)	S.D. (in cm.)
HV	150.2-175.0	162.29±0.38	5.40±0.271
TFH	9.9-12.7	11.25±0.437	0.61±0.030
PFH	16.0-20.5	18.22±0.061	0.86±0.043
EBB	8.3-10.7	9.64±0.033	0.47±0.023
IB	2.3-4.6	3.21±0.022	0.31±0.016
BBA	8.6-12.3	10.51±0.042	0.60±0.030
BGB	12.8-15.4	14.12±0.358	0.50±0.025

Table 2: Mean and S.D. for the multiplication factors for six facial measurements with regard to the stature of male Kabuis of Imphal valley (N=199)

Parameters	Multiplication factors (Mean)
TFH Vs HV	14.459±0.059
PFH Vs HV	8.922±0.032
EBB Vs HV	16.861±0.059
IB Vs HV	50.752±0.342
BBA Vs HV	15.483±0.067
BGB Vs HV	11.49 ±0.031

Table 2 presents the mean multiplication factors for the six facial parameters with regard to stature. We can see from the table that the highest multiplication factor is Inter-Ocular Breadth (50.752).

It is evident from Table 3 that all the Facial parameters show positive co-relation with stature significantly ($p < .001$). The highest co-relation of stature is found to be with Bigonial Breadth with 'r' value of 0.365 followed by External Bi-ocular Breadth (0.326), lowest (0.185) for Breadth of Bizygomatic Arch.

Table 3: 'r' Value and S.E. for ten facial measurements with respect to stature of male Kabuis of Imphal valley (N=199)

Parameters	'r' Value	Standard error
TFH Vs HV	0.213	0.067
PFH Vs HV	0.245	0.066
EBB Vs HV	0.326	0.633
IB Vs HV	0.273	0.065
BBA Vs HV	0.185	0.068
BGB Vs HV	0.365	0.061

Linear Regression Equation, which may be employed for the calculation of stature from six different facial measurements, is presented in Table 4.

Table 4: Linear regression equations for estimation of stature (S) of male Kabuis of Imphal valley (N=199).

Stature	Linear regression equation	Variable
S =	141.261 + 1.869X	Where X = TFH
S =	134.456 + 1.527X	Where X = PFH
S =	126.336 + 3.730X	Where X = EBB
S =	147.095 + 4.722X	Where X = IB
S =	144.790 + 1.665X	Where X = BBA
S =	107.004 + 3.913X	Where X = BGB

Table 5 represents the mean of difference between observed stature and estimated stature. For the purpose, ten subjects were randomly selected from the population under study. Their stature (observed) was noted down and compared with the estimated stature calculated by using Multiplication factor of the six facial parameters.

Table 5: Mean of the difference between observed status and estimated stature of male Kabuis of Imphal valley calculated using multiplication factor (N=199)

Estimation from M.F. of (parameters)	Difference between observed & estimated stature from M.F. (mean)
TFH	7.340 cm ±1.643 cm
PFH	5.554 cm ±1.299 cm
EBB	5.886 cm ±1.380 cm
IB	14.704 cm ±2.957 cm
BBA	7.948 cm ±1.940 cm
BGB	2.637 cm ±0.414 cm

It is observed from the table that the difference between the estimated stature from the observed stature ranges from the lowest (2.637

cm) for Bigonial Breadth (BGB) to highest for Inter-ocular Breadth (14.704 cm). It implies that the estimation of stature using Multiplication factor is found to be most reliable in case BGB with regards to the present study.

Table 6 represents the mean of difference between observed stature and estimated stature of ten randomly selected subjects. Their stature (observed) was noted down and compared with the estimated stature calculated using the linear regression equations.

Table 6: Mean of the difference between observed status and estimated stature of male Kabuis of Imphal valley from linear regression equations (N=199)

Estimation from M.F. of (parameters)	Difference between observed & estimated stature from M.F. (mean)
TFH	3.834 cm $\pm$ 0.7271 cm
PFH	5.234 cm $\pm$ 1.447 cm
EBB	3.729 cm $\pm$ 0.681 cm
IB	3.366 cm $\pm$ 0.995 cm
BBA	3.374 cm $\pm$ 0.663 cm
BGB	3.268 cm $\pm$ 0.8203 cm

The stature was estimated for each individual from the linear regression equations and compared with the observed stature, and found that the difference between the estimated stature from the observed stature ranges from 3.268 cm to 5.234 cm and difference is again found to be lowest for Bigonial Breadth with a value of 3.268 cm. It implies that the estimation of stature from BGB, using linear regression equations is found to be most reliable as compared to other facial parameters under study.

The current stature estimation study after statistical analysis and data interpretation has clearly revealed that the highest correlation of stature is found to be with Bigonial Breadth among the male Kabuis of the Imphal valley.

Again further analysis of Table 5 and 6 have also indicated that it is more reliable to use linear regression equations rather than Multiplication factor, as evident from the current course of investigative study on the estimation of stature using different facial measurements among the Kabui Nagas of the Imphal valley.

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