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MEITEI PANGALS OF MANIPUR AND IDENTIFICATION OF THEIR STATURE USING CEPHALOMETRIC MEASUREMENTS

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Stature as is one such important anthropometric parameter which helps in personal identification of an individual. The present study attempts to reconstruct stature from some selected cephalometric measurements among 200 male Meitei Pangals of Manipur by using standard measurement techniques. Data analysis reveals significant co-relation between stature and various cephalometric measurements under study. Total Facial Height shows the highest correlation co-efficient value (r = 0.381) while Upper Facial Height the least (r = 0.112). Multiplication Factors are found to vary from other populations of Manipur so far studied thus revealing inter- population variation within the state. Simple regression equations for estimating stature are also formulated for this particular population.

Introduction

Forensic anthropology primarily pertains to the personal identification, may it be of a living person or a dead body or partly decomposed or mutilated bodies or the skeletonised remains to recognize the individuality of that person. This identification may be complete or partial. Complete identification means the absolute fixation of the individuality of the person and the determination of the exact place in the community occupied by him, whereas partial identification deals with ascertainment of only some facts about identity while others remain still unknown.

In forensic anthropology, an investigator has to confront two main tasks (Stewart, 1979) viz.

i) The assessment of remains in reference to a population, and

ii) The reconstruction of a specific individual

In forensic anthropology, stature of an individual is one of the most important parameter that can be used in personal identification of criminals, victims of crime, disaster, war and so on. Important mathematical equations such as multiplication factor, regression equations are established to estimate stature both at the individual and population level. However, it is not possible to employ either multiplication factors or regression equations of one population to estimate the stature of another population. It is mainly because of the fact that the ratios of various body parts to stature differ from one population to another (Duyar and Pelin, 2010). In addition to ethnic variations, secular trends and even environmental factors such as socio-

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economic and nutritional status can also influence body proportions (Meadows and Jantz, 1995., Melina, 1991). In this perspective, several authors studied this subject in different populations, and observed significant inter-population differences in body proportions. It is also worth to mention that Allbrook (1961) established through his study that there exists a non-significant difference in the estimated height obtained through bone length and the length of the same bone measured percutaneously in case of living individuals.

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.*, 1965). It is well known that estimates based on upper limb long bone measurements are highly accurate and of all the mathematical methods used, regression formulae based on long-bone measurements yield the most accurate results (Duyar and Pelin,2010). In a similar approach, many workers have demonstrated positive co-relation between stature and other body dimensions (Duggal and Nath,1986; Nath *et al.,* 1990,1997; Anand and Nath, 1990; Singh, 1991; Harashawardhana, 1996, Kaur, 1998; Jain, 1999; Vani and Nath, 2000).

Though research works on reconstruction of stature from long bones as well as from certain body dimensions have been put forward for some of the Indian populations, only a few research works have attempted to reconstruct or estimate stature from different facial measurements (Singh. J. *et al.*, 2005). 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 cephalometric dimension in human body. Moreover, research and experience has advanced considerably enabling to estimate what someone looked like from his skull by the technique of facial reproduction (Ubelaker, 1996).

Keeping the above discussions in view, the present work attempts to reconstruct stature from some selected cephalometric measurements among male Meitei Pangals of Manipur who are also known as *Manipuri Muslims*. The first batch of Meitei Pangal who reached Manipurwere the original settlers of Syllet (now in Bangladesh). They came to Manipur during the reign of *Khagemba* (1597-1652 A.D.) as war captives. They reached Manipur in 1606 A.D. to help *Sanongba,*hostile brother of the then king *Khagemba* in revolting against the throne. After a fierceful fighting, the king's armies captured many Muslim warriors and were later allowed to settle in Manipur. They were given lands and Meitei women as their wives. Thus, a new group of population i.e. mixture of Aryan Muslim stock and the native Meitei women came into existence in the soil of Manipur. These new group of population were known as '*Pangal'* by the Meiteis which is a corrupted word of *'Bangal',* for they came from Bangladesh (Shah, 1990). Since then they were living in Manipur with distinct socio-cultural as well as bio-physical identity. Thus, the newly emerged Muslim population started settling in different areas of Manipur with a new ethnic

name 'Meitei Pangal' or 'Manipuri Muslim'. They belong to Sunni group of Muslim and follow the Hanafi Code of Jurisprudence.

Materialand Methods

Data for the present study were collected from 200 normal male Meitei Pangals of the four valley districts of Manipur viz. Imphal East, Imphal West, Thoubal and Bishnupur whose age range from 20 to 60 years. Eight cephalometric dimensions of each subject along with their stature were measured following the methods of Singh and Bhasin (2004) and Nath (1993). All the subjects included in the present study who were randomly selected were free from any apparent symptomatic deformities. The following are the cephalometric measurements and their respective abbreviations considered for the study.

1. Stature/Height Vertex (HV)
2. Total Head Height (THH)
2. Maximum Head Length (MHL)
4. Maximum Head Breadth (MHB)
5. Breadth of Bi-zygomatic Arch (BBA)
6. Nasal Height (NH)
7. Nasal Breadth (NB)
8. Upper Facial Height (UFH)
9. Total Facial Height (TFH)

The data were subjected to systematic statistical treatment using SPSS-17.00 for calculation of Multiplication factors, Co-efficient of correlation and formulation of linear regression equation.

Results and Discussion

The relevant statistical constants and their respective standard errors of the eight cephalometric parameters are presented in table 1. It is evident from the table that the average height of the male Meitei Pangals fall under the range 150.6 cm to 178.9 cm with a mean value of 164.07±0.38 cm, and a standard deviation of 5.47±0.27 cm. The average THH falls under the range 17.5cm to 26.4 cm which give a mean value of 24.02±0.09 cm. The mean valueof MHL, MHB and BBA are19.41±0.04 cm, 15.41±0.03 cm and 14.32±0.01 cm respectively. NH and NB show a mean value of 5.22 ±0.03 cm and 3.92 ±0.02 cm respectively. The mean value of UFH is 7.06±0.04 cm while that of the TFH is 11.99±0.05 cm.

Table 2 present various multiplication factors of cephalometric measurements under study. It reveals that NB shows the maximum value of MF (41.98±0.18) which is followed by NH (31.56±0.15). The minimum value is observed for THH (6.86±0.03) which is followed by MHL (8.45±0.02).

Table 3 highlights the correlation co-efficient (r) values between stature and cephalometric measurements among male Meitei Pangals of Manipur. It suggests that TFH gives the maximum 'r' value with stature (0.381) at the significant level of 0.01. It is followed by THH (r = 0.369) at the same significant level. The least

'r' value 0.112 is for UFH which is followed by MHB (r = 0.168) at the significant levels of 0.05.

Table 4 shows the linear regression equations for estimation of stature from all the cephalometric measurements under study. It isobserved that thetwo facial dimensions viz. TFH(r = 0.381) and UFH (r = 0.112) exhibit the highest and lowest correlation with stature respectively. It is also observed that the 'r' value of the two nasal dimensions viz. NB and NH with stature stood at the midway between TFH and UFH. The maximum standard error of estimate is also observed in case of UFH (±5.438) while the minimum is observed in case of TFH (±5.068).

Table 5 highlights a comparative study of multiplication factors for cephalometric measurements among different living populations of Manipur so far studied. Data available for comparison is TFH, MHL, MHB, NH, NB and BBA. In case of TFH, Multiplication Factor of Manipuri Muslim (13.71) is found to be the least while the highest (14.80) is observed for the Lois of Phayeng. In case of MHL, MHB, NH, NB and BBA, record of two populations including the present study is available. Comparing the MFs of MHL for the Lois of Phayeng and the Manipuri Muslims, the Lois of Phayeng (MF= 9.06) is found to be greater than the present study (MF= 8.45). Same is the case in case of MHB as MF for the Lois of Phayeng is found to be 11.26 while that of the Manipuri Muslim is 10.65. Again in case of NB, MF of Lois of Phayeng (45.63) is higher than the MF of Manipuri Muslims (41.98). MF of NH for the Meiteis of Manipur (32.53) is also found to be higher than the Manipuri Muslims (31.56). Comparison of MF for BBA is made between Kabui Naga of Imphal Valley and the present study. It is observed that the MF of Kabui Naga (15.48) is much higher than the Meitei Pangals of Manipur.

Conclusion

While comparing with other population it is observed that both multiplication factors and regression equations formulated for male Meitei Pangals exhibits variation from those of other populations studied so far by various researchers. Further it is also observed that the Meitei Pangals are found to differ in their body proportions when compared with other population. These conclusions are in support of the findings of various researchers. Similarly, the linear regression equationformulated for stature estimation among male Meitei Pangals also exhibit variation from other populations confirming the Meitei Pangals as a distinct ethnic group. Hence, it is well confirmed that means of stature estimation i.e. multiplication factor, regression equations are population specific. Therefore, means of stature estimation formulated for a particular population should not be used to other population and to opposite sex. In conclusion, it is confirmed that means of stature estimation i.e. multiplication factors and regression equations are population specific. Therefore, derived formulae for a particular population should not be used to other population.

TABLE 1: MEANANDSTANDARDDEVIATIONSOFCEPHALOMETRIC MEASUREMENTS AMONGMALE MEITEI PANGALS OF MANIPUR

Parameter	*Min. (cm)*	*Max. (cm)*	*Mean. (cm)*	*S.D. (cm)*
HV	150.6	178.9	164.07±0.38	5.47±0.27
THH	17.5	26.4	24.02±0.09	1.14±0.07
MHL	18.1	20.7	19.41±0.04	0.56±0.03
MHB	14.5	15.9	15.41±0.03	0.38±0.02
BBA	12.2	15.5	14.32±0.01	0.44±0.02
NH	4.2	6.2	5.22±0.03	0.37±0.02
NB	3.2	4.6	3.92±0.02	0.24±0.01
UFH	6.6	7.8	7.06±0.04	0.52±0.03
TFH	10.3	13.9	11.99±0.05	0.70±0.04

TABLE 2: MULTIPLICATION FACTORSOFCEPHALOMETRICMEASUREMENTS AMONG MALE MEITEI PANGALS OF MANIPUR

Parameter	*Multiplication factors*
THH	6.86±0.03
MHL	8.45±0.02
MHB	10.65±0.03
BBA	11.46±0.03
NH	31.56±0.15
NB	41.98±0.18
UFH	23.35±0.12
TFH	13.71±0.05

TABLE 3: CORRELATION VALUES BETWEEN STATURE AND CEPHALOMETRIC MEASUREMENTS AMONG MALE MEITEI PANGALSOF MANIPUR

Parameter	*Correlation(r) values*
TFH	0.381**
THH	0.369**
MHL	0.343**
NB	0.320**
NH	0.301**
BBA	0.294**
MHB	0.168*
UFH	0.112*

** Correlation is significant at 0.01 levels (2-tailed)
* Correlation is significant at 0.05 levels (2-tailed)

TABLE 4: LINEAR REGRESSION EQUATIONSFOR ESTIMATING STATUREFROM CEPHALOMETRIC MEASUREMENTS AMONG MALE MEITEI PANGALSOFMANIPUR

Regression Equation	*S.E.E.*	*Valueof 'r'*
S= 128.206+ 2.989(TFH)	± 5.068	0.381
S= 128.081+ 1.501(THH)	± 5.095	0.369
S=98.451+ 3.383(MHL)	± 5.151	0.343
S= 135.419+ 7.308(NB)	± 5.193	0.320
S= 151.794+ 2.338(NHT)	± 5.398	0.301
S= 112.132+ 3.626(BBA)	± 5.240	0.294
S= 135.366+ 1.858(MHB)	± 5.345	0.168
S= 155.981+ 1.150(UFH)	± 5.438	0.112

TABLE 5: MULTIPLICATIONFACTORSFORCEPHALOMETRICMEASUREMENTS AMONG DIFFERENTLIVINGPOPULATIONSOF MANIPUR

Population(male)	*Author/year*	*Multiplication factor*					
		TFH	*MHL*	*MHB*	*NL*	*NB*	*BBA*
Meiteis of Manipur	Devi & Nath/2001	14.14	-	-	32.53	-	-
Lois of Phayeng, Manipur	Singh. J. *et al.*/06	14.80	9.06	11.26	-	45.63	-
Kabui Naga of Imphal Valley	Jibon Kr. & Lilin/2006	14.46	-	-	-	-	15.48
Muslims of Manipur	Present study	13.71	8.45	10.65	31.56	41.98	11.46

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